Report of the Committee to conduct study and make recommendations for the development of Industries based on Ethyl Alcohol

Ministry of Chemicals & Fertilisers
Government of India
New Delhi

December 1977

CONTENTS

APPENDICES

LIST OF REFERENCES

1. Tariff Commission's reports 1965, 1969, 1975.
2. Report of the Fermentation Panel, Development Council for Organic Chemicals Industries 1977.
3. Report of Committee for augmenting the production of alcohol, Ministry of Petroleum & Chemicals 1975.
4. ICMA Handbook of licensed capacities 5th edition.
5. Indian Chemical Journal—Annual 1976.
6. Statistical data prepared by AABIDA for meeting on 18-7-1977.
7. Statistical data prepared by Somaiya Organics (India) Ltd.
8. Mr. Olaf Winter and Meng Tack Eng. Chemical Industry Development, p. 13, May, 1977.
9. Sugar News Vol. 9 No. 1 of 1977.
0. Shri S. L. Venkateswaran, Chemical Industry Developments page 73, August 1974.
1. Technic Chemie, Bombay.
2. Shri S. L. Venkateswaran, Popular Plastics, March, 1975.
3. Shri S. L. Venkateswaran, The Chemical Times, August 22, 77.
4. Report on Naphtha Cracker by Development Council for Organic Chemicals.
5. Report of Jalan Committee on levies on molasses and alcohol December, 1976.
6. Report of Vinod Kumar Committee.
7. Distillery effluent treatment in the Brazilian National Alcohol Programme, The Chemical Engineer, April, 1977

REPORT OF THE COMMITTEE TO CONDUCT STUDY AND MAKE RECOMMENDATIONS FOR THE DEVELOPMENT OF INDUSTRIES BASED ON ETHYL ALCOHOL

SUMMARY

An account of the present status of the alcohol industry and the industries based on alcohol as raw material to manufacture chemicals has been given. The survey of the industry was based on the questionnaires sent by the Committee to the various industrial units, information collected by actual visits to a few distilleries, discussions held with the All India Distillers Association, All India Alcohol Based Industries Association and the persons having long experience with industry. The present trends in the industry have been surveyed and indications as to where the industry might go if timely action is not taken have been given. Information on the present status of technology used in the distillery industry as well as alcohol based chemical industry have been given. Recent developments in Brazil on the production of alcohol by the fermentation process and the projected programme to use alternative source to produce alcohol have been indicated. Estimates of the likely production of alcohol with the present status and improved status have been given. Estimates of the requirement of alcohol for the alcohol based chemical industry on the basis of 10% annual growth rate have been given. Constraints on the development and growth of alcohol based industries have been discussed and suitable measures to remedy them have been indicated. An immediate need to undertake research and development programme has been stressed.

Recommendations:

1. In view of multiplicity of taxes and levies, control by State and Central Governments on movement and allocation of molasses and alcohol, low efficiencies in the fermentation process and inadequate growth of alcohol based chemical industries, and inadequate interest taken by entrepreneurs to improve efficiencies it is recommended that a high powered body with wide ranging powers be formed to monitor the progress of the industry to have a 10% annual growth rate and administer funds for research and development work covering immediate needs and long range needs.

2. The amount of Rs. 20/- per tonne of molasses provided for at present for the construction of storage tanks for molasses should discontinued from the price of molasses. Instead a cess of Rs. 0.03 (3 paise) per litre should be charged on the price of alcohol to provide funds for research and development work both in the distillery industry as well as the alcohol based chemicals industry. The committee recommends an incentive scheme to be drawn up by the controlling body for progressively increasing the efficiency of the distilleries to a yield of 260 litres of alcohol per tonne of molasses gradually over a period of 3 years. The efficient units producing above 240 litres per tonne of molasses throughout the season may be allowed to export up to 5% of the alcohol produced. The units that would show improvement in technical efficiency may be given liberal and timely allocation of molasses.

3. There is urgent need to improve the technical efficiencies of the distilleries and make maximum alcohol available from the present supply of molasses. For this purpose it is necessary to employ adequate number of technically qualified people in the industries. A course of bio-chemical engineering available with the HBT Institute of Kanpur is most suitable.

4. AIDA and AABIDA should form technical cells for adopting modern techniques in industries.

5. There is justification in reducing the price of molasses.

6. The price of alcohol as delivered to the alcohol based industries should be about Re. 1.00 per litre.

7. While licensing new industries based on alcohol, preference should be given for the manufacture of chemicals where acetaldehyde is the building-block and lower preference where ethylene is building-block. However, the present ethylene based industry should be allowed to grow at the rate of 3 to 4% per year. In remote areas where petro-based ethylene is not available alcohol-based ethylene units may be permitted.

8 The use of molasses based alcohol for the potable purpose should be restricted in order to maximise the availability of alcohol for industrial use.

9. There is going to be a wide gap between the alcohol available and the requirements of alcohol based industries. Immediate steps must be taken to develop processes to produce alcohol from alternative source since this will have to he a long range development project. For immediate relief, Khandsari molasses could be brought under control for additional production of alcohol. This has already been done in some States.

10. It is possible to develop indigenous technology for the alcohol based industries provided a planned effort is made.

11. Some States are contemplating diversion of alcohol for motive power and for fuel purposes. This should be considered after meeting the full requirements of the chemical industry.

12. Research and Development work must be undertaken in the new avenues of fermentation technology in selective fermentation processes using a revolutionary new technique of immobilised enzymes. The low energy technology is much more appropriate to India than the utilisation of conventional technologies which require high energy inputs.

13. Minimum economic size of new distilleries is recommended as 10-12 thousand Kilolitres per year. Preference should be given to the existing distilleries below the economic size to expand their capacity.

Acknowledgement:

The committee wishes to place on record its appreciation of the work done by Shri A. D. Patankar Senior Technologist, Hindustan Organic Chemicals Ltd., Rasayani

Sd/ A. Swaminathan
Sd/ Lata Singh
Sd/ S. K. Somaiya
Sd/ A. B. Roychowdhuri
Sd/ S. S. Sachdeva
Sd/ S. P. Bhattacharya
Sd/Bhagwan Din
Sd/ U. K. Misra
Sd/ S. R. Jambusaria
Sd/ U. T. Bhalerao
Sd/ J. D. Joshi
Sd/ C. O. K. Ummer
Sd/ K. S. Tiwari

This is subject to a note of my dissent

Sd/S. P. Seth
for S. P. Mann

21-11-1977

INTRODUCTION AND SCOPE OF THE COMMITTEE'S WORK

Alcohol is a valuable source for production of organic chemicals. Prior to the development of organic petrochemical industry alcohol was extensively used for production of organic chemicals. After the second world war petrochemical feedstock dominated the organic chemical industry because of its easy availability and cheaper cost. During this period the organic chemical industry diversified into various fields such as polymers, pesticides, artificial fibres and many other chemicals. Recently there has been some rethinking for a dependable feedstock because of the steep rise in the price of petroleum and secondly it has now been realised that the available resources of petroleum products will be soon exhausted. Even for the generation of power alternative sources of energy are being investigated. Alcohol therefore, becomes a valuable feedstock for organic chemicals, especially because the supplies are generated every year through agricultural crops.

In the year 1955, the Government of India had appointed a committee under the Chairmanship of Dr. A. Nagrajrao to assess the scope for increasing the production of alcohol in the country. In those days the production of alcohol was very low and the by-product molasses of the sugar factory were being wasted for want of enough capacity for recovery of alcohol. The committee, after investigating the various factors, had suggested a number of products with alcohol as the base material. Since then there has been considerable expansion of the alcohol industry alongwith the increase of sugar production. A number of industries based on alcohol have been started since then.

During the last 20 years considerable developments have taken place in the field of chemicals, Phamaceuticals, Pesticides, Synthetic Rubber and Plastics based on Ethyl alcohol. Fresh proposals are also being received by the Central Government from time to time. It was, therefore, necessary to review the situation and make a comprehensive study at Government level, relating to the growth of industries in this field and the requirement of industrial alcohol. The Government of India decided to set up a committee to make a study and prepare a report regarding planning of alcohol based industry. The committee was constituted vide office order No. L-15021(i) 77-ch-II dated 17th Feb 1977 issued by the Ministry of Chemicals and Fertilizers. Govt. of India as under.

1.	Shri A. Swaminathan, Managing Director, HOC Ltd., Bombay.,	Chairman
2.	Shri S. S. Sachdeva, Adviser Petrochemicals, Ministry of Petroleum.	Member
3.	Smt. Lata Singh, Director, Ministry of Chemicals & Fertilizers.	Member
4.	Shri S. P. Bhattacharya, Industrial Adviser, D.G.T.D.	Member
5.	A representative of CSIR.	Member
6.	One representative each from the States of U.P., Maharashtra, Tamil Nadu and Gujarat.	Member
7.	Representative of AIDA, New Delhi	Member
8.	Representative of All-India Alcohol Based Industies Development Association.	Member
9.	Dr. K. S. Tiwari, Monitoring & Evaluation Officer Ministry of Chemicals & Fertilizers.	Member-Secretary

The terms of reference of the committee were as follows:

(i) To prepare the present status of the industries based upon alcohol i.e. total approved capacities, actual installed capacities and the production achieved.

2—1 M of PC & F/ND/78

(ii) To work out estimates of capacity likely to materialise by the end of the 5th Plan i.e. 1978-79.

(iii) To assess long range demand estimates for a period say 15 years.

(iv) To recommend specific areas of alcohol based industries in which future growth needs to be planned.

(v) To examine the constraints on the development and growth of the alcohol based industries and recommend suitable remedial measures.

(vi) To make any other recommendation which may help in increasing the availability and utilization of alcohol for industrial purpose.

The following were nominated by the respective organisations.

Organisation	**Nominee**
U. P. State Government	Shri Bhagawan Din, Excise Commissioner Government of U.P. Alternate : Dr. U. K. Mishra, Alcohol Technologist, U. P. Government.
Maharashtra State Government	Dr. J. D. Joshi, Joint Director of Industries, Maharashtra State.
Tamil Nadu State Government	Shri C. O. K. Ummer, Joint Director of Industries & Commerce (Chemicals) Tamil Nadu.
Gujarat State Government	Shri S. R. Jambusaria, Joint Director of Industries (Raw Materials) Gujarat.
C.S.I.R.	Dr. U. T. Bhalerao, Scientist E Regional Research Laboratory, Hyderabad.
All India Distillers Association	Shri S. P. Singh Mann, President A.I.D.A.
All India Alcohol Based Industries Development Association.	Dr. S. K. Somaiya President AABIDA: Alternate: Shri A. B. Roy Chowdhary, Vice-President AABIDA.

The following persons attended the meetings as invitees.

Shri A. K. Mukherjee, Special Secretary & Commissioner Excise & Finance Dept., Government of West Bengal.

Shri S. K. Bhattacharya, Excise Commissioner, West Bengal Government.

Shri D. K. Agarwal, Development Officer, D.G.T.D.

Smt. Lalitha B. Singh, Ministry of Petroleum.

Shri O. N. Chandoke, Secretary, AIDA.

Shri P. M. Kavadia, AIDA.

Shri M. R. G. Menon, AIDA.

Shri Y. V. S. Murthy, Managing Director, M/s. Alkali Metals (P) Ltd., Hyderabad.

Brief Account of the Committee's Work:

The committee held its first meeting at New Delhi on 14th March 1977. The programme of work was discussed. In order to collect the necessary information questionnaires were prepared and sent to sugar factories, existing

producers of alcohol. to the producers of alcohol based chemical industries, excise commissioners and directors of industries of the State Governments. Subsequently seven meetings were held.

In order to get on the spot information of the distillery industry a small group of the committee visited distilleries in the major alcohol producing States of India. Meetings were arranged with the All India Distillers Association and All India Alcohol Based Industries Association. In these meetings various problems of the industry were discussed. Both the associations submitted memoranda stating their problems and suggestions to remove their difficulties. The latest information on research and development taken place in India as well as outside India, was obtained by contacting the various agencies. Discussions were held with the eminent bio-chemists and microbiologists and also with the experienced technocrats and executives in the industry. The National Sugar Institute, Kanpur and the H. B. Technological Institute, Kanpur were visited to assess the facilities available for training personnel to man the industry and get technical assistance to the industry.

Method of presentation of report:

The pattern adopted for the report is as follows:

— Summary & Conclusion

— Chapters — subjects in order and in relation to conclusions

Work done by the previous Committee (Dr. Nagrajrao Committee appointed in 1955)

In the year 1955 when the Nagrajrao Committee was to review the position of alcohol industry, the main use of industrial alcohol was as power alcohol for admixture with petrol, the other use being for potable purpose. The consumption of alcohol at the time was only 3 to 4 million gallons per year. Molasses were in surplus and unused. The disposal of molasses was a problem to the sugar factories and they had to pay the carting charges for disposal of molasses. Molasses were causing pollution. During the war years the alcohol indostry got fillip due to shortage of petrol and few distilleries were started. Recommendations for alcohol based industries, were for first time made by the Nagrajrao Committee with a view to increase production of alcohol and utilise the surplus molasses available. The petroleum refineries had not been established in India at that time and therefore Naphtha and other petroleum world the production of chemicals based on petroleum feedstock was increasing. In view of the low initial capital cost required to put up plants based on alcohol for production of Polyethylene, Butadiene, and PVC, the recommendations made by the committee were accepted by the industry and foundations of the alcohol based industries were laid at that time.

The principal issues that the committee considered were as follows:

(1) Taxation and control over alcohol by the State and Union Government. The committee recommended a uniform taxation policy. The committee recommended that control over price and distribution of molasses should be exercised by the Union Government under the powers conferred by Industries Development and Regulation Act. A ceiling price for alcohol was calculated after taking into account the cost of production in a unit of economic size as well as the actual average transport charges. on molasses from sugar factory to the distillery. The committee recommended a uniform ceiling price for alcohol ex-distillery. The committee recommended a uniform taxation policy and procedure by Union and State Governments.

(2) The committee stressed the need of utilization of the surplus alcohol. They recommended some major projects based on alcohol with a view to increase the utilisation to over 31 million gallons. As a result of this recommendation the present alcohol based industrial units have come into existence.

(3) The committee recommended to continue the use of alcohol with petrol as a fuel for the motor cars until such time that the available alcohol was put into industrial use.

(4) Since enough molasses were available at that time it was not necessary to look for alternative sources for production of alcohol.

(5) The committee studied the economics of production of alcohol and recommended a price at which the organic chemical industry can purchase alcohol.

(6) The committee suggested a graded taxation depending upon the performance for which it was used by the industry.

(7) The committee recommended a minimum capacity of a distillery of economic size as one million gallons per year.

(8) The committee recommended a price for molasses and price was to be controlled by the Union Government.

After the recommendations of the Dr. Nagrajrao Committee on price of alcohol, there had been references to the Tariff Commission for determining the fair price of alcohol.

In October 1975 the price of molasses was raised steeply. A certain amount from the price has to be set apart for construction of storage tanks for molasses. It was a common complaint by the distilleries that the molasses received were stored in open pits by the sugar factories and by the time they were received the sugar content had dropped down considerably.

The cost of production of alcohol had also gone up. The price of alcohol was therefore increased on two counts (1) increase in cost of production (2) increase in price of molasses.

The necessity of uniformity of taxes has been repeatedly recommended by the various committees and tariff enquiries. The last committee to study this problem was Jalan Committee which submitted its report in December 1976. They concluded that the levies charged by the various State Governments vary from state to state and are complicated.

In spite of the need uniformity of control and taxes and levies on industrial alcohol, nothing has been done over the period of years. Since Jalan Committee has studied in detail this problem recently, the present committee has refrained from spending much time over it.

Note:—Yields of alcohol wherever mentioned in this report are based on A grade molasses.

PRESENT STATUS OF THE ALCOHOL INDUSTRY AND THE CHEMICALS BASED ON ALCOHOL

The production of alcohol was taken up initially with a view to utilise by-products molasses available from the sugar factories. This increased rapidly with growing sugar production. Power alcohol was the main product marketed initially for mixing with petrol. Government of India appointed a Committee in October 1955 with a view to examine the manner in which total alcohol production in the country can be fully utilised, either as Power Alcohol or more particularly for industrial purposes, and to recommend industries which can be expanded or established having regard to increase in the availability of Alcohol for Industrial purposes in the country.

The market for Power Alcohol tapered off gradually with the commissioning of the three Refineries in the country. A number of projects were however, taken up in the light of the recommendations of the Alcohol Committee 1955 Some of the important ones were,

(1) Low Density Polythylene.

(2) Styrene Butadiene rubber

(3) Polystyrene.

(4) Acetic Acid.

(5) Acetic anhydride and acetates.

(6) Polyvinylchloride.

The production of alcohol is intimately connected with the sugar industry, which is an agro-based industry. Availability of molasses has been a subject of variations due to fluctuations in production of sugar, and therefore, this has reflected in the production of alcohol from year to year. At certain periods, the alcohol based industries found it very difficult to operate due to shortage of alcohol, and substantial quantities of alcohol had to be imported to keep them running.

Distillery industry:

The production of alcohol in India can be said to have started in 1931, when about 19 distilleries were set up, having a total production of 3.7 million litres of potable alcohol in that year. Between 1931 and 1947, the production of alcohol increased to 60 million litres. Between 1947 and 1960, the number of distilleries increased to 51 and the production reached 81 million litres. From 1960 to 1966, the production of alcohol rose steeply due to growing demand and increased availability of molasses and reached a level of about 195 million litres in 1966. Production was depressed during the period 1965 and 1968 but again improved in 1969. The figures of production of molasses and alcohol for the last four years as given by State Governments at the meetings of Central Molasses Board as as follows:

	Molasses Lakh Tonnes	**Alcohol Million Litres**
1973-74	18.25	367.97
1974-75	20.15	400.60
1975-76	18.00	408.19
1976-77	20.00	438.00(Estimated)

Although the industry has claimed 101 distilleries in production with a licensed capacity 603.7 million litres only 71 distilleries are in production as per D.G.T.D. records. Tbe Tariff Commission in its report submitted to Government in 1975 had accepted 88 distilleries with a total capacity of 488 million litres. Further addition to capacity after 1975 is not substantial.

Efficiencies:

The process of manufacture falls into two main steps:-

(1) Fermentation

(2) Distillation

Over the last thirty years the distilleries have been working at a certain standard of efficiency and there has not been any appreciable improvement in their working. Although the Central Government had been impressing upon State Governments that the average recovery of alcohol should be 225 litres per tonne of molasses some of the State Governments have been asserting that the average yield has been as low as 180 to 200 litres.

The Tariff Commission and the 1955 Report of the Alcohol Committee have recommended certain standards of efficiency, at which the distilleries were expected to work. The monotoring part of this directive has been left with the State Excise departments. The distilleries are reporting periodically their efficiency data to the Government. From this data it appears that there is considerable scope for improvement in their working. On an average, the fermentation efficiency is between 80% to 85% and the distillation efficiency is between 93% to 98%. For most of the time, the reason put forth for lower efficiencies is that the quality of Molasses was poor or that the Molasses were diluted. For a long time the price of Molasses as fixed by the Government was Rs. 10/- per tonne for the distillery industry. However, the open market price for this commodity has been at times around Rs. 200 to Rs. 250/- per tonne. This resulted in the improper care taken by the sugar industry for storing the Molasses and at several times the Molasses were stored in open tanks and kutcha pits. Realising the need for better price for Molasses the Government increased the price to Rs. 60/- per tonne which included Rs. 20/- per tonne for provision of proper permanent storage tanks. For the last few years this amount has been available to the sugar factories to construct storage tanks. The sugar industry has realised about Rs. 7 crores (gross) on this account during the last two years which should be adequate for construction of proper storage tanks. In years to come, the quantity of dilute Molasses is expected to diminish. Even the figure of 225 litres recommended by the Government of India is considered to be on the lower side and if proper supervision and care is taken and technical improvements are made, it is not difficult to reach a figure of 260 litres.

In recent years, the State Governments have been apprehensive of the pollution problem owing to the spread of various industries. This has also made an impact on the distillery industry which products huge quantities of effluents which, if let out without treatment, can cause enough pollution. It has been the practice of the industry to let the effluent without any treatment. The industry is finding it difficult to bear the cost of treatment. Two major processes have been developed for the treatment of effluents of the distilleries. In one case the effluent is bio-de-graded by lagooning over a period of 50 to 60 days and then feeding it to the sugarcane crops after dilution. This requires large area of land of the distilleries and also of the sugarcane fields within the neighbourhood. The other method is directly diluting it with water and feeding it to the sugarcane crops. Both these require large areas of land and some of the old distilleries which did not have this facility are facing a problem.

Alcohol based industries:

Ethyl alcohol is a chemical which can be readily converted into either Ethylene or Acetaldehyde, both of which are important starting points for synthetic chemicals. The Alcohol based industries can be established with comparatively small initial capacities as against the Petro-based industries. The use of Ethyl alcohol enables the production of high purity Ethylene straightaway without any corresponding problem of by-products and their utilisation,

as it occurs in the case of Petrochemical Ethylene. The major units producing chemicals based on Industrial Alcohol are as follows: —

(1) Sirsilk Ltd., Sirpur — Kagaznagar A. P.

(2) Andhra Sugars Ltd., Tanuku, A. P.

(3) Andhra Pradesh Industrial Development Corporation, Hyderabad.

(4) Hindustan Polymers Ltd., Vishakhapatnam, A. P.

(5) Hindustan Insecticides Ltd., Delhi & Alwaye.

(6) Gujchem Distilleries India Ltd., Bilimora, Gujarat.

(7) Union Carbide Ltd., Bombay.

(8) Kolhapur Sugar Mills Ltd., Kolhapur, Maharashtra.

(9) Somaiya Organics (India) Ltd., Barabanki, U. P.

(10) Indian Organic-Chemicals Ltd., Bombay.

(11) Polychem Limited Bombay.

(12) Chemicals & Plastics India Ltd., Madras.

(13) Synthetics & Chemicals Ltd., Bareilly, U. P.

(14) Somaiya Organo-Chemicals Ltd., Sakarwadi, Maharashtra.

(15) Alkali & Chemical Corporation of India Ltd., Rishra, West Bengal.

(16) Mysore Sugar Company Ltd., Mandya.

(17) Colour-chem Ltd., Bombay.

The installed capacities of these major industries and their production for the previous three years is given separately. These industries have come to stay and have been operating for the last 15—20 years.

The industries fall into two main categories — (1) the ones requiring higher proportion of Alcohol per tonne of product e. g. Polyethylene and (2) industries requiring less Alcohol per tonne e.g. Acetic acid. The industries basically have been finding difficulties in getting regular supplies of alcohol throughout the year. The processes are of a continuous nature and if distrupted for want of alcohol, the production efficiencies suffer as during a shut down and start up, the raw material is wasted. The plant utilisation also suffers. The industries requiring larger proportion of alcohol have a greater problem since their requirements are large and they have to run about to get the supplies in time. The price paid for the raw material alcohol by the various industires varies from 80 P. per litre to Rs. 1.5 from State to State. This is due to a wide variation in the taxes as well as variety of levies imposed on this product from State to State. In some cases alcohol has to be hauled over long distances. Since alcohol has come to stay as a basic raw material for chemical industry the alcohol should be taxed at the some rate as other raw materials. At present the industry is not only suffering from irregular supplies but also from irregular prices of alcohol.

In spite of these difficulties the industries are making efforts to maintain their production as per their installed capacities, and wherever the production has been lower than the laid capacities, in most of the cases, it has been mainly due to the shortage of alcohol. The industries have plans to enlarge their capacities provided increased supplies of alcohol would be made available to them.

The current consumption of alcohol for the various Aicohol based industries in the organised sector is of the order of 300 million litres. The allocation of alcohol from the surplus States to the deficit States is done every year by the Ministry of Chemicals and Fertilisers on the advice of the Central Molasses Board and its various Regional Committees from time to time. As in the case of Molasses, West Bengal is the major deficit State in alcohol. The major share of alcohol released from the surplus States goes to West Bengal.

The price of Alcohol is being controlled by the Ethyl Alcohol Price Control Order, 1971. The ex-distillery price of rectified spirit of 94.68% strength as per the Control Order dated 1st November 1975 is Rs. 589.1 per kilo-litre exclusive of taxes. The problem of variety of taxes prevailing has been studied in detail by the Jalan Committee which submitted its report to the Government recommending uniformity of levies — and instead of retaining the various levies that are known by the different names such as Purchase tax. Vend fee, Administrative charges, Gallonage fee, etc., the Committee has suggested that these levies should be reduced to a single uniform levy.

PRESENT TRENDS

A. Alcohol

It can be seen from the plethora of taxes, rules, regulations and fluctuations in the supply of alcohol to the industry the production of alcohol being agrobased, that there is no long term plan for the production of alcohol or for the growth of alcohol based industry.

As shown in Appendix No. 10 inadequacy of technical control in the distilleries is cause for concern. Unless strict controls are exercised it is apprehended that the yields of alcohol per tonne of molasses may drop down. This would, therefore, lead us to believe that by 1984-85 or so, at the most optimistic rate when we expect to reach a sugar production of around 7 million tonnes, a molasses production of around 3 million tonnes the alcohol production would be around 600 million litres only. But if the efficiencies are improved and yield goes up to 260 litres as is technologically possible the production of alcohol from sugar factory molasses alone could be over 720 million litres. This once again shown a compounded growth rate of roughly 4% per annum. It may be recalled that any industry which is at such an embryo stage of development as the alcohol-based industry stands today should grow at the rate of atleast 10-15% per annum to be able to maintain a healthy state of affairs. In fact, it should from the year 1977-78 onwards maintain a compounded growth rate of a minimum of 10%.

One of the major disadvantages that alcohol faces as an industrial feedstock, is that it is not subject to central control although the Central Govt. uses its good offices to make alcohol available from surplus States to deficit States. In fact, it is high time that we should now consider alcohol with the same importance and give it the same pride of place as Naphtha, Gas Oil or any petroleum feed stock, which is in extensive use in the chemical industries.

Alcohol is subject to multiple levies by the producing and consuming States. Appendix No. 12 and 13 will show multiplicity which exists in the plethora of levies exercised in various States which are also depending on various purposes that alcohol is used for. Not only levies but also pricing patterns vary from State to State. Under these conditions, as well as the absence of long term supply plan of alcohol to the consuming industries the growth of alcohol based industries has not been satisfactory.

As we can see technological improvement as well as increased capital investment, both the required before the distilleries start yielding somewhat in the region of 250 to 260 litres of alcohol per tonne of molasses. This yield is attainable because so far our fermentation efficiencies have been based on 80-85% of the fermentable sugar rather than on the total reducible sugar content of molasses. It is possible to achieve atleast 20% more yield than current day yields, which are in the region of 200.220 litres per tonne. Technologically speaking, the total reducible sugar content of molasses is a good 10 to 15% higher than the total fermentable sugar content, and it is also possible to convert even a non-fermentable sugar by additional enzymatic processes to alcohol. Secondly, although distillation efficiencies are high in terms of overall yields, the distillation economies are not optimum. There seems to be no conscious thermal balance made around the distillation units, there is inadequate or no instrumentation to control and record flows, temperatures, pressures, and densities around the distillation columns. It appears, therefore, that considerable energy saving can also be achieved with the existing plants, provided certain investments are made.

Another aspect is the increasing use of molasses based alcohol towards potable purposes or towards other than industrial uses wherever the revenue receipts from alcohol can be increased. If this continues, according to present day trends, then the extra production which will be achieved by 1984-85 (600 million litres from 438 million litres in 1976-77) may almost all go towards potable and other less important uses. In fact, it can be seen from the graph in Appendix No. 2 that inspite of the projected 4% growth and increase in production of alcohol, the availability of alcohol for manufacture of industrial

3—1 M of PC & F/ND/78

chemicals will still remain nearly stagnant. It is estimated that in a production of 438 million litres for the year 1976-77, approximately 125 to 130 million litres will be used towards potable liquor and miscellaneous uses.

One of the other factors regarding the availability of alcohol for industrial purposes is considered to be the increasing diversion of sugarcane to Ghur and Khandsari production. Almost 60% of the sugarcane grown in India is used for Khandsari production and thereby starving sugar mills of their capacity utilisation which in turn starves alcohol distilleries (for industrial purposes). It is not known which way the split between Khandsari and Gur can be made because of lack of adequate data; but it is well-known that even Khandsari molasses are not used for distillation in any significant fashion.

With all this in mind, one must turn towards the availability of alcohol over the past 10 years for the purpose of industrial production. It is seen that the average capacity utilisation of chemical plants based on alcohol has ranged from 50 to 80%. The breakeven capacity utilisation of chemical plants is in the region of 75 to 80%. The availability of alcohol to the alcohol based chemical units to cross this breakeven point is therefore essential.

Sometimes it so happens that because of the lack of timely availability of alcohol, many chemical plants had to be stopped and restarted frequently, thereby resulting in low capacity utilisation as well as inefficient productivity in the plants.

B. Alcohol Based Chemical Industry

Before proceeding on the alcohol based chemical industry, it may be worthwhile to give a brief outline of the chemistry that goes into the production of such chemicals which are derived from alcohol.

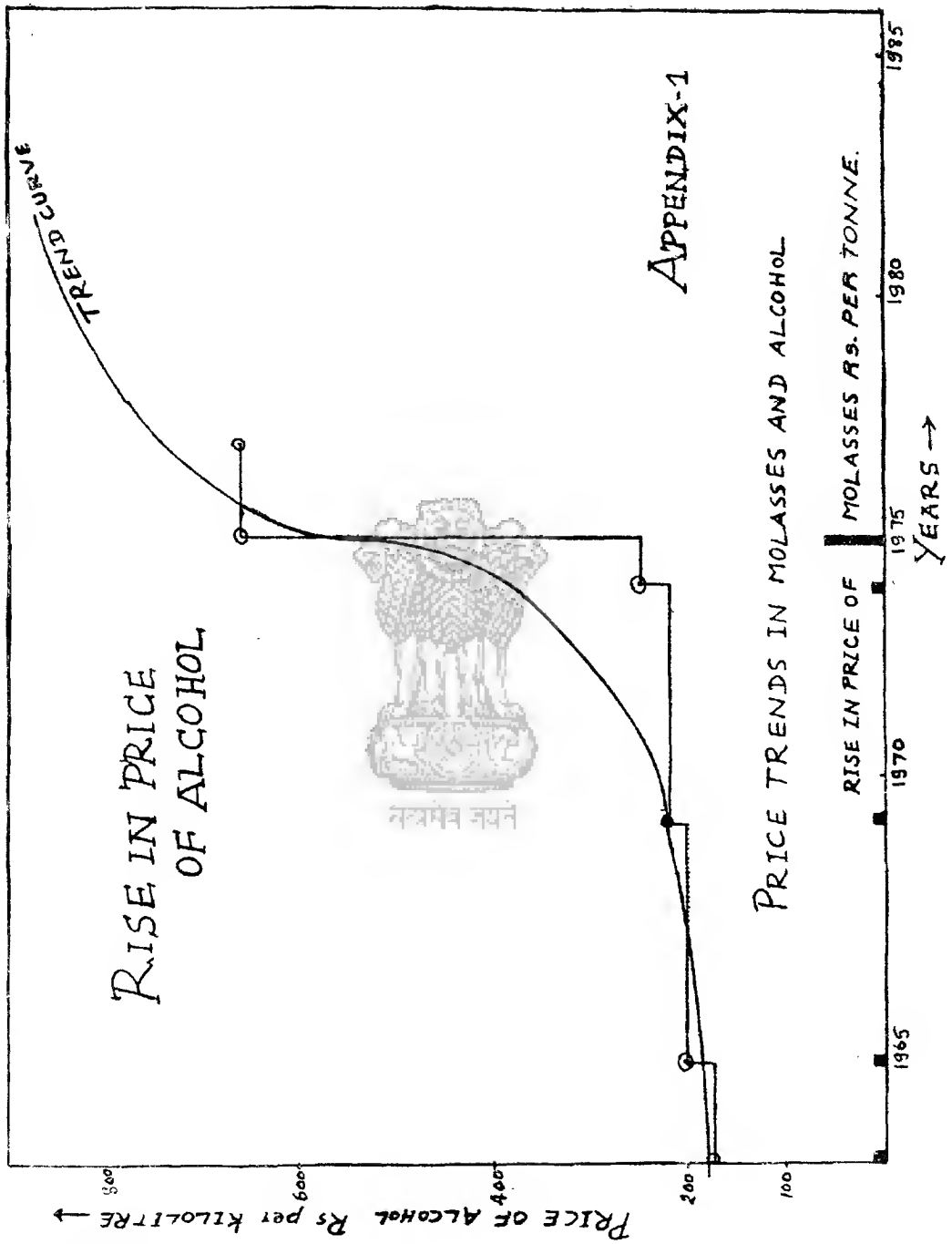
Alcohol is basically utilised for the making of certain basic building blocks which can also be produced by petrochemical sources. These basic building blocks are Acetaldehyde, Acetic Acid, Ethylene, Acetone and various other chemical products such as Ethyl Acetate, Chloral, Ethylamines, Ethyl Chloroformate etc. which presently in India are of comparatively little significance. Basically, the two major building blocks concerning the utilisation of ethyl alcohol are acetaldehyde, acetic acid and ethylene. Appendix No. 21 shows a complete chart of the products which can be derived from alcohol, but appended herewith is a more concise form of the chart for the various major chemicals which can be derived from alcohol.

The two most basic reactions are as under:

(1) C_2H_5OH	Dehydrogenation ⟶	$CH_3CHO + H2$
Ethyl Alcohol $2C_2H_5OH + O_2$	Oxidation ⟶	Acetaldehyde $2CH_3CHO + 2H_2O$
CH_3CHO	Oxidation ⟶	CH_3COOH Acetic Acid
$CH_3CHO + CH_3CHO$	$-OH$ ⟶	$CH_3CH(OH)CH_2CHO$
$CH_3CH(OH)CH_2—CHO$	Dehydration ⟶	Acetaldol $CH_3CH=CH—CHO$
$CH_3CH=CHCHO$	Hydrogenation ⟶	$+ H2O$ $CH_3CH_2CH_2CH_2OH$ Butanol
(2) C_2H_5OH	Dehydration ⟶	C_2H_4 Ethylene

Before we go any further, it should be made clear that ethyl alcohol as a feedstock for the production of certain basic organic building blocks is certainly more ideal for Indian purposes because of the following reasons:

(a) It is a recyclable feedstock and can be derived from agricultural produce by utilisation of "low energy" technology, namely fermentation.



1 M of PC&F/ND/78

(b) In a country short of petroleum crude oil and which has to incur very high foreign exchange costs to import these derivatives and where, through agricultural means an alternative feedstock is available, the alternative replenishable feedstock becomes more important both economically and strategically.

(c) Certain chemicals can be more easily produced from alcohol with a much lower feedstock content requirement via the alcohol route than from petrochemical routes, thereby being more economically viable via the alcohol route. This allows thereby the erection of smaller capacity plants on a viable basis, thereby providing more employment opportunities.

(d) Ethyl alcohol as a feedstock has been well established in India and during the past 20 years the growth of the alcohol based chemical industry has almost kept pace with the growth of the petrochemical industry.

It may be mentioned that there are several references where a more detailed chemistry of the alcohol based products can be obtained. We have so far not yet mentioned that the comparison of ethyl alcohol as a feedstock is really being made with naphtha which is a fraction from crude oil distillation. Other feedstocks such as LPG/GAS etc. for the purpose of producing the same range of chemicals as can be produced from alcohol have not found much significant use in India as yet. The utilisation of alcohol in itself for the production of industrial chemicals has reached the same order of magnitude as that of naphtha for the same chemicals.

As a parallel it may be said that other 'oil short' nations such as India are also embarking upon ambitious programmes based on alcohol as feedstocks like Brazil. It is, therefore, expected that in India we should have achieved significant new capacity installations of alcohol based industries. The picture however, is far from satisfactory in spite of the fact that India was a pioneering nation in establishing a high standard of chemical industry based on alcohol. It may be, however, noted that the position today is such that can be seen from Appendix No. 18. Unfortunately, because of the lack of more reasonable data, we have based the growth of the alcohol based chemical industry on the establishment of capacity for acetic acid, the figures for which are more readily available and since it is most ubiquitous chemical derived out of alcohol. In fact, all our growth factors are based on the "acetic Index" as against other chemicals. It can be seen from Appendix No. 3 graphically that except for a short spurt in the capacity expansion after the Nagrajrao Committee Report, even the acetic acid industry is tending towards stagnancy and practically 'zero' growth rate. If this is the case, then let us examine also the other chemicals which are being derived from alcohol such as PVC, polyethylene styrene/polystyrene, butanol/butanol derivatives such as butyl acetate, and synthetic rubber etc. While capacity utilisation of most of the units has been good in years of plenty, the capacity utilisation in some cases is less than 50%, acetone and pentaerythritol may be sighted as instances of low capacity utilisation, for the following reasons:—

1. The units have locational disadvantages.

2. The delivered price of alcohol is prohibitive and petrobased products are cheaper in these cases.

3. The units suffer from technological difficulties and constraints.

Given below is a table of the present installed capacity of various chemicals based on alcohol in the organised sector. Details of the small sector are not available. It is estimated today that around 300 million litres per annum are being consumed by these various industries. It is also possible that several of these industries could, with marginal investments, debottleneck their plants and could achieve even upto 125% capacity utilisation.

ALCOHOL BASED INDUSTRIES IN OPERATION AS ON 1-12-'76
(information given by DGTD)

Product	No. of Units	Installed capacity tonnes	Production in 1976 tonnes	Capacity Utilisation %
Acetic Acid	9	29220	24984	85.5
*Acetic Anhydride	5	11770	5700	48.4
Butyl Acetate	4	8730	3781	43.3
Ethyl Acetate	8	6390	4915	76.9
Monochloro Acetic Acid	4	6900	3652	52.9
Pentaerythritol	2	1800	298	16.5
DDT	2	4200	4527	107.8
Styrene	3	33000	21061	63.8
Polyethylene	1	13000	13000	100
Acetone	1	1500	30	2
Butanol	3	8250	3522	42.6
Butadiene	1	25200	10462	41.5

*Does not include the production of Mysore Acetate as it is mainly captive (exclude 4450) although I. C. includes this capacity.

Use of denaturants

It has been pointed out that there is no uniformity of procedure in regard to utilisation of denaturants in various States Indian Standard specifications for alcohol denaturants are available. These may be followed by all concerned. The specifications have been given on page 66 for easy reference.

STATE OF TECHNOLOGY FOR ALCOHOL AND ALCOHOL BASED CHEMICALS

Technology for manufacture of Alcohol

Alcohol is at present manufactured exclusively from molasses, a by-product of the Sugar Industry. Molasses is the mother liquor left after crystalising of sugar and besides sugar, it contains a good amount of mineral and colloidal matter. Sugar yield alcohol when subjected to fermentation by yeast. Normally, molasses contain 50% sugar of which the total fermentable sugar is 45% and 5% is non-fermentable. The molasses are diluted to the required strength and acidified with Sulphuric Acid in larger fermentation vats. The requisite amount of yeast and a nutrient like ammonium sulphate is added. Fermentation takes place with the evolution of carbon-dioxide and heat. In most cases, carbon-dioxide is allowed to escape in the air but it can be recovered by carrying out fermentation in closed vats and collecting the evolved gas. The process of fermentation is to be carried out at a controlled temperature. For this purpose, cooling of fermentors by circulating the wash through heat exchanger or cooling the outside walls of the fermentor with spray of water is necessary. The process of fermentation is complete by about 36 hours, resulting into 6-7% alcohol in the wash. The wash liquor known as beer is steam distilled to recover the alcohol. The distillation is done in two stages by two different distillation columns known as a Analyser and Rectifier. At the end of rectification we get purified alcohol separated from fuse oil but it contains about 5% water. This water cannot be removed by the dehydration column. The product at this stage is known as rectified Spirit. For most of the use, rectified Spirit is quite suitable and is used with or without the admixture denaturants. If 99.5% alcohol is required, it is necessary to process it in a dehydrating column.

The overall efficiency of operation of alcohol distillery is computed from the fermentation efficiency and the distillation efficiency. The fermentation efficiency is usually in the range of 71% to 86%, the distillation efficiency in the range of 95% to 98%, and the overall efficiency 72 to 88%, the yield of alcohol per tonne of molasses ranges from 193 to 260 litres.

Technologically the present state of the alcohol industry leaves much to be desired. The process is just carried out without much attention to the reaction parameters and there is inadequacy of measuring instruments for temperature rate of flow, quantity of raw material input.

In the fermentation process the following essential checks are not being followed in many distilleries:

(1) Temperature control, this is the key-note of the process.

(2) Control over yeast inoculum.

(3) Follow up of development of acidity by measurement at intervals.

(4) Cleaning of fermentors after completion of the batch to remove deposits of calcium sulphate and thorough cleaning by steam to remove wild yeast.

(5) Cleaning of pipelines to remove contaminations.

(6) Controlling the temperature of the fermentators by installing heat exchangers functioning as coolers.

(7) Covering of fermentors to prevent contamination.

(8) Attention to sanitation and good housekeeping in the distillation part of the process. Considerable saving in energy cost can be achieved by (a) lagging of analyser and rectifying columns and the pipelines. (b) use of heat exchangers to conserve heat such as recovering heat from spent wash, (c) running main distillation column under pressure or under vacuum, (d) installation of automatic control for distillation to regulate steam supply, flow rate of the feed and quantity of reflux, (e) keeping proper percentage of alcohol in the wash. A 4% concentration

in the wash requires 3.62 kg. of steam per litre of alcohol 7% concentration requires 2.2 kg. of steam and a 10% concentration requires 1.76 kg. of steam per litre of alcohol. Next to cost of raw material, cost of steam is a major cost and there is scope for improvement.

A fair size analytical laboratory for process control at every stage is essential. Employment of technically qualified supervisors is lacking. This is rather distressing because enough trained persons are being turned out every year through our educational institutions.

Effluent Treatment

The distilleries discharge on an average 15 litres of spent wash per 1 litre of rectified spirit produced. Practically very little or no treatment is given to this waste water in majority of the distilleries. The discharge of spent wash cause a serious pollution problem. The B.O.D. of the spent wash is found to be around 40,000 mg/litre. The concentration of dissolved inorganic solids is also very high. The proportions of Nitrogen and Phosporous with respect to B.O.D. are low and are sufficient for treating waste water anaerobically. A number of methods have been reported and tried for treatment of the spent wash from the distilleries. Among the biological methods of treatment anaerobic logoons are formed in the first stage of treatment to reduce B.O.D. The spent wash is allowed to degrade over a period of 35 to 60 days. At this stage the B.O.D. content is reduced to about 3,000. This wash is then diluted with fresh water in such proportion to bring B.O.D. down to the required standard and used as water for irrigating the sugarcane. It has been found that it has served as a good manure and the yield of sugarcane is increased. If sufficient water is available for dilution and facilities for sugarcane cultivation are not available the effluent can be disposed off by sending it to a Nala. This has been the easier method to dispose off effluent.

There is another method in which the spent wash is treated by combination of anaerobic and aerated lagoons to bring down the B.O.D. to 400 gm/litre. This treated effluent after suitable dilution for correcting the TDS concentration can be disposed off on land for irrigation. In order to bring down the B.O.D. to 100 gm/litre an additional treatment employing extended irrigation principles is to be adopted for treating the effluent from anaerobic-aerobic lagoons system.

There are other methods such as solar evaporation method in which the wash is simply allowed to evaporate by spreading over large area. This may not be feasible with many distilleries as it requires a large area. The method of evaporation of spent wash and recovery of potash has been suggested but is not very much economical. Some experimental work has also been done in anaerobic digestion of wash and collecting the gas for use as fuel for domestic and industrial use. However this process has not become very much popular.

The National Sugar Institute, Kanpur has developed a process for treatment of effluent by the ammonification process. In this case spent wash is diluted with two volumes of water supplemented with 0.1% v/v of waste yeast sludge from the distillery and treated with ammonifying bacteria in the treatment pits of continuous flow process. This is a special culture developed in the laboratory. Ammonia is produced from the proteins yeast sludge present in spent wash. This neutralises part of the acidity and reduces the B.O.D. to 3000 ppm. The detention period is only 3 to 4 days. The advantage in this process is the period is small and the area of land required is much smaller, about 1/4 hectare. This process may be useful for the distilleries which do not have enough land at their command.

The process developed by Prof. B. Subbarao of College of Engineering, Sangli has been adopted by many distilleries. It is claimed that 15 distilleries are following this method. The effluent is treated by the anaerobic process of biodegradation in lagoons over a period of 45 to 60 days. Initially the process has to be started by adding cart loads of cowdung.

A number of process for the treatment of the effluent are available and each unit should select its process depending upon the land available. It is recommended that the units must accept one process or the other and try to implement it instead of allowing the effluent to pollute the neighbouring area on a plea that the cost of the treatment is exorbitant. The industry should not shirk the basic responsibility of treatment of effluent and blame the authorities for the restrictions imposed.

Technology for manufacture of Alcohol based industries

A number of products can be manufactured from Alcohol. The method of manufacture of major items is described below:—

1. **Acetaldehyde**

Dehydrogenation Process

Alcohol is passed over a chromium-activated copper catalyst in a converter in the dehydrogenation process at a temperature of about 260°C. Hydrogen is evolved and is recovered as a bye-product and can be used further in hydrogenation phases for the manufacture of Butanol. The vapours of Acetaldehyde and ethanol are let to a scrubbing column where cold dilute ethyl alcohol dissovles ethanol and acetaldehyde. The stripped gases leaving the top of the scrubber are scrubbed again with water and released to atmosphere. The dilute alcohol, Acetaldehyde from the bottoms of the scrubbing column is rectified to produce 99% Acetaldehyde.

Oxidation Process

There is another process which is called oxidation process where ethyl alcohol vapours are mixed with pre-heated air and passed to reactor containing silver gauze catalyst. The reactor temperature depends on air/ethanol/steam ratio, velocity of the gas over the catalyst and may vary from 375°C to 550°C. The rest of the process is same as the dehydrogenation process. Many factories seem to follow this process due to ease of operation and lower consumption of alcohol but if credit for hydrogen is taken into consideration the dehydrogenation process is more economical. By-product hydrogen can be used to manufacture other chemicals, thus the raw material is better utilised. This process is recommended for new projects. As far as possible the oxidation process should not be used.

$$\underset{\text{Ethyl Alcohol}}{CH_3CH_2OH} \xrightarrow{\text{Dehydrogenation}} \underset{\text{Acetaldehyde}}{CH_3CHO} + H_2$$

$$CH_3CH_2OH + 1/2\ O_2 \xrightarrow{\text{Oxidation}} CH_3CHO + H_2O$$

2. **Acetic Acid**

Acetaldehyde is oxidised by air in presence of Potassium Permanganate and Manganese Acetate as Catalysts to form Acetic Acid. The crude Acetic Acid which is discharged from the reactor is continuously rectified to 99% glacial acetic acid.

$$\underset{\text{Acetaldehyde}}{CH_3\text{-}CHO} \xrightarrow{\text{Oxidation}} CH_3COOH$$

3. **Acetic Anhydride**

Vapours of glacial acetic acid with 0.2 to 0.3% triethylphosphate are passed into a tubular reactor heated to 700 to 800°C under reduced pressure. As reaction gases leave the converter, ammonia gas is injected into the steam to prevent reversion of the ketene in the product. The exit vapours from the reactor containing acetic anhydride, acetic acid and ketene and water are led to a series of condensers where weak acetic acid is condensed before

it can react with the ketene. The uncondensed ketene is absorbed is acetic acid to give acetic anhydride of 90% purity which is then fractionated to yield acetic anhydride of required specifications.

There is another process to manufacture Acetic Anhydride directly from Acetaldehyde. Air is bubbled through liquid acetaldehyde in reactor in the presence of a catalyst such as a mixture of copper and cobalt acetate or manganese acetate which prevents the formation of explosive amount of per-acetic acid. About 1.4 part of acetic acid per one part of acetaldehyde is present as a diluent to promote acetic anhydride formation. The reactor is maintained at the temperature of 50 to 70°C and the pressure is approximately 60 PSI. The over head from the crude vacuum column is fractionated in a acetaldehyde column giving acetaldehyde for recycle as the over-head and water and diluent as bottoms. The diluent is returned to the reactor after the water is separated.

The dyhydrated mixture of acetic anhydride and acetic acid from the bottom of the crude vacuum column is separated by distillation. Acetic acid is removed as over-head and the acetic anhydride is withdrawn from a bottom plate. The catalyst is taken from the bottom to be reused. The acetic anhydride is further purified by vacuum distillation.

(1) $CH_3COOH \longrightarrow CH_2=C=O + H_2O$
$CH_3COOH + CH_2=C=O \longrightarrow (CH_3CO)_2O$

(2) $CH_3CHO + O_2 \longrightarrow CH_3COOOH$
$CH_3COOH + CH_3CHO \longrightarrow (CH_3CO)_2O + H_2O$

4. **Acetone**

For the manufacture of the Acetone, Alcohol vapours along with steam are passed over Iron Catalyst in a furnace at a temperature of about 400 to 600°C. The resulting gases are condensed. Methane is a bye-product and is vented. The crude acetone is purified by distillation. At present there is only one plant producing acetone from alcohol. The production has considerably dropped down recently.

5. **Butanol**

Acetaldehyde is condensed in presence of aqueous solution of sodium hydroxide as a catalyst. The reaction is exothermic. The product thus formed is unstable and known as Acetaldol. The crude acetaldol is acidified by adding Acetic Acid and treated to a moderate temperature which subjects the aldol to catalytic dehydration. This water saturated Crotonaldehyde is obtained.

Crotonaldehyde is hydrogenated in vapour phase using Copper Catalyst in presence of hydrogen, producing Butanol. The reaction takes place according to the following equation:

$$CH_3CHO + CH_3CHO \xrightarrow{OH} \underset{\text{Acetaldol}}{CH_3CH(OH)CH_2CHO}$$

$$CH_3CH(OH)CH_2CHO \xrightarrow{\text{Dehydration}} \underset{\text{Crotonaldehyde}}{CH_3CH=CH-CHO} + H_2O$$

$$CH_3CH=CH-CHO \xrightarrow{\text{Hydrogenation}} \underset{\text{Butanol}}{CH_3CH_2CH_2CH_2OH}$$

Butyl Acetate

Butyl Acetate is produced by the esterification of Acetic Acid and Butanol in presence of solid sulphonic resin as catalyst. The reaction is catalysed by Ion Exchange resin of the sulphonated polystyrene type used in its acid form. The still is heated under total reflux by jacketed steam until

the head temperature of the distilling column become constant. After this equilibrium is reached, the distillate is withdrawn from the column as rapidly as possible without raising the head temperature which is about 89°C.

$$CH_3COOH + C_4H_9OH \longrightarrow CH_3COOC_4H_9 + H_2O$$

Ethyl Acetate

The required amount of Ethyl Alcohol and Acetic Acid are taken and then the Acid Catalyst is added. The mixture is then heated. The crude product thus obtained is further purified by distillation to get the pure grade product.

$$CH_3CH_2OH + CH_3COOH \longrightarrow CH_3COOC_2H_5 + H_2O$$

Ethylene based Chemicals

Ethylene is the basic building block for products such as polyethylene, ethylene-di-chloride, vinyl chloride and styrene. Normally feedstock for production of Ethylene is from the petrochemicals source. However, in India conditions were favourable for using alcohol as the feedstock.

Ethylene is produced by dehydration of Ethyl Alcohol by passing alcohol over aluminium catalyst this gives Ethylene of 97% purity. It is further purified in a two column system operating at a moderate pressure and low temperature using auto-refrigeration system. It is found that the activity of the catalyst declines with continued use. It is a common practice to compensate for the deactivation by progressively increasing, the temperature of the reaction but eventually the activity of catalyst reaches a level to which further operation is uneconomical and it has to be replaced by new catalyst or reactivated by burning off the carbon deposited. The regeneration does not bring the catalyst to its initial level of activity. There is scope for improvement in the use of catalyst. Crotonaldehyde used as a denaturant in alcohol is said to affect the life of catalyst. It is necessary to change the denaturant eliminating this disadvantage.

Low Density Polyethylene

Polyethylene is produced by compression of Ethylene at a very high pressure, in two stages. Polymerisation of Eethylene takes place at high pressure of 1,000 atmosphere and temperature of 300°C. There is of course the low pressure, ziegler process being used exclusively by PIL in India which produces high density Polyethylene for superior mechanical properties than LDPE but from Petrochemicals feedstock.

Vinyl Chloride

Vinyl Chloride is an intermediate for the production of Poly Vinyl Chloride. Poly Vinyl Chloride is extensively used for manufacture of electrical goods, pipes for chemical plants and as building material. Ethylene-dichloride required to produce Vinyl chloride is manufactured by number of methods. It is produced by vapour-phase reaction of ethylene and chlorine in the presence of catalyst in chlorinating tower maintained at 42 to 50°C. The resulting products are passed from the top of the tower through a partial condenser above 85°C into a separator. Gaseous Ethylene-di-chloride is fed into a fractionating column to give refined product. It can also be produced by reaction of Ethylene and hydrogen chloride and air in a fluid bed catalytic process. The catalyst is a mixture of copper and other chlorides.

Vapourised Ethylene-dichloride is dried and passed over a contact catalyst such as pumice or charcoal. The catalyst is usually packed in staioless steel directly heated in a cracking furnace at 50 PSIG and temperature between 480 to 510°C. The hot gases from the furnace are cooled by direct contact with a steam of Ethylene-di-chloride and uncondensed gases are sent to a surface condenser to recover the remaining vapour. The uncondensed gases are scrubbed with water to recover the hydrogen-chloride.

4—1 M of PC&F/ND/78

The combined liquid steams from the cooler and condenser are fed to a fractionating tower operated under sufficient pressure to give Vinyl Chloride by condensing the over-head vapours in a water condenser. The vinyl chloride is polymerised to produce poly-vinyl chloride.

Styrene

The raw materials for Styrene are Benzene and Ethylene. Benzene is alkylated with Ethylene in the presence of aluminium chloride catalyst to produce ethyl-benzene. Ethyl-henzene is then catalytically dehydrogenerated in the presence of steam or benzene to nroduce Styrene. The alkylation reaction is exothermic and carried out at 95°C. Cooling water is used to control the temperature.

Synthetic Rubber

Butadiene and styrene are the two monomers required for the production of synthetic rubber. The conversion of alcohol to butadiene is as shown below:—

$$CH_3CH_2OH \longrightarrow CH_3CHO + H_2$$

$$CH_3CH_2OH + CH_3CHO \longrightarrow CH_2{=}CH{-}CH{=}CH_2 + 2H_2O$$

A mixture of ethyle alcohol and acetaldehyde in the ratio of 1:3 is passed over a catalyst maintained at 300°C.

A variety of products are obtained by changing the composition of ratios of styrene and butadiene and these products are of great value as ruhher reinforcement plastic and protective coatings. Styrene has been co-polymerised with vinyl chloride, vinylidene chloride, maleic anhydride to give products of specific performance.

Developments in manufacture of Alcohol by fermentation process in Brazil

As in India fermentation alcohol is an important chemical in Brazil. However, as more petroleum based ethylene became available, the percentage of ethanol based industries declined steadily from 33% in 1970 to about 7% in 1974. The total ethanol production led its peak level in the 1972-73 period with 710 million litres. The use of ethanol for ethylene derived products declined from 1970 to 1972 and ceased completely in 1973 when ethanol based ethylene plants were shut down. The purchase of petroleum based ethylene for the production of ethylene derivatives was more economical. As late as in September, 75, it was predicted that ethanol in Brazil was not expected to regain its former foot-hold in the production of industrial chemicals which it held in the past.

A turn around however, was initiated by the Brazilian Government in Decemher 1975 when a decree was published to implement a national alcohol programme. An inter-ministrial committee was formed to define the incentive policies, priorities and executive plan for the programme. The committee is composed of representatives of six ministries.

The main objective of the programme is to limit petroleum imports and to reduce the out-flow of foreign currencies. One major problem the country is facing is the high cost of imported oil which is holding down the amount of capital available for industrial development. Brazil imports 80% of the petroleum needs being about dollars 3.2 hillion per year. The search is on for ways to replace the use of crude oil which is needed mainly for transportation and for production of petro-chemicals. At present the yield of alcohol produced from sugar factory molasses is 300 litres per tonne. It is planned to increase the current Brazilian ethanol production of about 767 million litres per year to almost 4160 million litres per year by 1980 and 6240 million litres per year 1982. In 1982 66% of the production would be osed for mixing with the gasoline (maximum of 25% could be added) and the balance 34% would be available as feedstock for chemical industries.

By 1980, already 1040 million litres of alcohol is designated for chemical industry. fn order to attract local and foreign investments in the chemical industry the Government of Brazil will subsidise the price of ethanol so that it would be available at a price of per MT not to exceed 35% of the price per MT of ethylene manufactured from petroleum. Investors after submitting required proposal documents, are authorised tu proceed with their ethanol based projects and arrange for financing through Bank of Brazil.

Since the decree was published, numerous local and foreign companies have qualified to install new ethanol based facilities in Brazil. This Government programme will without doubt stimulate Brazil's entire ethanol industry enormously. Ethylene from ethanol plant will be important factor in this growing industry.

In the Ist Phase of the plan to increase the production of alcohol from 710 million litres to 4,000 million litres per year by 1980, it will be achieved by the restarting of inactive distilleries in sugar factory and building of new distilleries. This will mean 150 new distilleries and the Government's contribution for financing these distilleries will be of the order of 60%.

Three types of distilleries are involved:

(1) Distillery attached to an existing or new sugar factory utilising factory services. Feed-stock can be cane-juice/cane molasses.

(2) Central distillery—This distillery will serve a number of sugar factories within the specified area feed stock will be similar to the annexed distillery but at a much greater capacity.

(3) Autonomous distillery—The concept of the autonomous distillery is a self-contained industry divorced from sugar or food manufacture in which the feed stock itself is product of tropical agriculture, and not a by-product.

At present serious consideration is being given to the sugar cane only for the autonomous distillery. Here a complete distillery will be developed whereby the distillery will have its own cane field estate similar to a Sugar Factory.

Other crops under consideration include manioca, a root crop, babassu-nut with a fast growth rate and sorgo the sweet stem similar to sugarcane of a variety of sorghum.

Because of its availability, manioca (Cassava) is possibly the only feed stock that can be considered at the moment as a serious competitor to sugarcane.

Fermentation techniques

To reduce the effluent load and increase its residual contents a high alcohol yield in the fermentated mash is highly desirable. Additional benefit is that less heat energy is required for distillation.

To reduce the effluent load and increase its residual contents a high technology with high attenuations can be achieved by a system derived from Melle Boinot technique whereby recycled yeast maintains a fermentation concentrate at a high yeast D. M. level. Most present day batch and continuous fermentation systems for high yield and fast conversion to industrial alcohol are based upon maintaining a high yeast concentration. However, yield is still limited by yeast inhibition of which the alcohol itself is the major factor.

A recent development in Brazil is to conduct the process of fermentation under vacuum. Normally, when the concentration of alcohol reached about 7% further increase in concentration inhibits the activity of the bacteria. In the process under vacuum, alcohol is continuously withdrawn so that the concentration remains between 3 to 4% in the fermentor. A pressure—of about 30 to 35mm Hg. absolute is maintained. This process may have a disadvantage that it requires high energy input to maintain

vacuum conditions. Modifications to the vacuum process are being investigated. The advantage of this process is that at 50% sugar strength, where water as well as alcohol is removed, there is a considerable concentrating effect which would result in low bulk of effluent.

The production of sugar in Brazil was 6.7 million tonnes in 1974-75 and the production of Molasses was 1.5 million tonnes. It is planned to increase sugarcane production considerably with objective of producing alcohol directly from cane juice without the intermediate step of production of sugar and molasses. According to the reports, more than 90% of the Molasses production is utilised by distilleries and utilisation of Molasses for the purposes other than alcohol was negligible. Molasses production was not expected to increase significantly within the next 5 to 10 years.

The National Alcohol Programme of Brazil have plans for utilisation of other fermentable substitutions in addition to Molasses. Other raw materials for fermentation being considered are—Mandioca, Sorghum, Sweet potatoes, Babacu nuts. The level of alcohol production technology available is considered to be sufficient. However, some of the Brazilian manufacturers have established cooperation with Licencers from France, Austria and West Germany. The first priority has been given to sugarcane as raw material. The Mandioca process (hydrolization of starch) has been developed and the first plant was expected to start production by end of October, 1977. However, it is intended to gain more experience and to optimize the process before the mandioca programme will be started.

The efficiency of alcohol production is indicated as follows:

	Crop/yield (ton/ha)	Alcohol litres/ha	litres/tonne
Sugarcane	45	3 015	67
Mandioca	12	2 160	180
Sweet potato	15	1 875	125

Sugarcane gives the highest alcohol yield per hectare followed by mandioca which can also be grown on land which is not suitable for cane. The processing of babacu is very complex because all parts of the nut will have to be utilized to make the project feasible. The utilisation of sorghum is in the pilot stage now and this programme will be started after the babacu programme. The utilisation of cellulosic materials (corn, rice and cane straw etc.) for the production of alcohol is said to be in a very initial stage at present. The capital cost for an independent distillery with a daily capacity of 2,40,000 litres is between Cr. $ 145.2 million or Cr. $ 189.8 million and for an annexed distillery of the same capacity it is about Cr. $ 97.6 million.

In Brazil substitution of gasoline by fermentation alcohol is considered economically feasible. However, it was also repeatedly said that not only the economic but also the strategic and social aspects of the programme must be seen.

RECOMMENDED TRENDS

Growth Rate and Selectivity

We have seen from the graphs that a minimum of 10% growth rate should atleast be feasible provided adequate planned development takes place in this industry. As has been indicated in the previous chapter, growth rates of atleast 10%, if not 15%, per annum on a compound basis should be encouraged in the following areas:—

(i) Acetaldehyde and its derivatives;

(ii) Acetic Acid, Acetic Acid esters & solvents;

(iii) Butyraldehyde, Butanol and other derivatives;

(iv) 2 Ethyl Hexanol and other derivatives of 2 Ethyl Hexanol such as DOP; DBH, DEP which are used as plastisizers.

(v) Acetone.

For this, immediate appropriate corrective action will have to be taken. As far as growth rate of other products are concerned such as Ethylene and Ethylene based derivatives, as indicated in table in the preceding chapter, it may not be necessary to encourage growth rates in this area, since both the feed stock cost element as well as other cost elements including technological routes to be employed, may work out to be too expensive. However, in order to make existing units based on alcohol for which production of Ethylene and Ethylene based products survive, a marginal growth rate of around 3-4% per annum together with ensurement of timely as well as adequate deliveries of feed stock, at reasonable price, could be expected for such units. In remote areas where petrobased ethylene is not available alcohol based ethylene units may be permitted.

Alcohol requirements

Assuming a minimum 10% of growth rate on the Acetic Index as an average, it is seen that by 1990, the requirement of alcohol will be in the region of 850 million litres. Assuming that the production of sugar is going to reach 7 million tonnes thereby yielding only 3 millon tonnes of molasses by 1984-85, the yield of alcohol would be at best with improved technologies, in the region of 720 million litres. Even if we were to assume that sugar growth rate may be maintained at the same rate up to 1990 as projected for 1984-85, commesurate yield of alcohol would be in the region of 850 million litres, and this 850 million litres would almost all be required, therefore, for the production of chemicals alone. Given below, is a table which indicates that on an estimated growth rate of 10% per annum, starting from 1976-77, the total requirement of alcohol assuming that diversion of molasses alcohol to potable liquor would be strictly limited to 150 million litres, the total requirement of alcohol would still be in the region of 1150 million litres.

TABLE

REQUIREMENT OF ALCOHOL

	1976-77	(*In million litres*) *1990/91 Estimated requirement at 10% growth rate*
Organic Chemicals and Pesticides	270	850*
Pharmaceuticals	25	95
Paints & Varnishes and other misc. uses	15	55
		1000
Potable use	130	150
	440	1150

1976/77 data from ministry of Chemicals & Fertilizers.

*85% capacity utilisation assumed for organic chemicals pesticides and pharmaceuticals.

This assumes also that the average capacity utilisation of all chemical/pesticides/pharmaceutical plants would only be around 85%. If, however, the capacity utilisation were to increase to 100% the figure of 850 million litres would increase further to 1,000 litres, thereby increasing the total requirement of about 1,150 million litres. The above assumptions are based on 150 million litres of molasses based alcohol for potable purposes. If, however, the same compounded growth rate is assumed for utilisation of molasses based alcohol to potable liquor production, the figure would increase from 1,150 million litres by another 210 million litres to 1,360 million litres. In view of the declared policy of prohibition it is expected that all the alcohol that is being consumed for potable purposes will be available for industrial use after four years. In that event the country will be self sufficient in alcohol for the next 5 to 7 years.

Assuming the same growth rate up to 1990/91 the deficit may be of the order of 200 to 250 million litres for which it would be necessary to develop alternative source of alcohol. This further underlines the need to harnest Khandsari molasses which is a ready source for alcohol. In addition newer technology for conversion of cellulosic materials to alcohol should be developed.

The committee has assumed 10% compound growth rate for the alcohol based industries. This presupposes setting up several alcohol based complexes which will consume substantial quantity of alcohol. For the units already in existence a quantity of 300 million litres should be able to satisfy their total requirement. So far commitment to the extent of 230 million litres over the present 440 million litres has been additionally made in respect of further approval all of which may not materialise.

Pricing

The committee has not gone in to the pricing aspect of alcohol as it was not in the terms of reference of the committee.

Under the present pricing conditions, assuming that the costs of production of Ethylene/Propylene from Naphtha/Gas feed stock will be at least around Rs. 2,500/- per tonne, a plant in a petrochemical complex involving a Naphtha Cracker of a size of million tonnes of Naphtha per annum will have to be constructed. A comparison table has been made for the manufacture of basic building complex via the Naphtha Cracker route as against Alcohol route. For the Alcohol route, it has been assumed that the delivered cost of the alcohol on present day basis will be in the region of Rs. 1 per litre to the user as against at delivered cost of Naphtha being around Rs. 1,200 per tonne to a petrochemical complex.

Comparison of feedstock cost element of products Alcohol-based and petro-based

	Alcohol Base		*Ethylene/Propylene Base*	
	Feed stock cost element Kilolitres	*Rs./MT*	*Feed stock cost element Tonnes*	*Rs./MT*
	1	2	3	4
Acetaldehyde	1.3	1300	0 67	2010
Acetic Acid	1.25	1250	0 74	2220
Acetone @	2.6	2600	1.04@	3120
Butanol @	1.9	1900	0.8@	2400
2 Ethyl Hexanol @	3.3	3300	1.0@	3000

Note @ : The figures for Butanol and 2 Ethyl Hexanol via Petrochemical source are deceptive because synthesis gas is required as additional feedstock which will mean additional naphtha requirement and therefore, a feedstock cost element increase by at least 30%.

	1	2	3	4
Ethylene	2.7	2700	1.0	3000
Styrene	0.7	700	0.32	960
Butadiene*	2.6	2600	1.00*	3000
Vinylchloride	1.2	1200	0.5	1500

* Made from Propylene by petrochemical route By-product from Naphtha Cracker.

Basis

Alcohol at delivered cost of Re. 1 per litre.

Ethylene/Propylene at Rs. 3000 per tonne.

The table above shows a guideline only to the preferential utilisation of alcohol as feedstock as against naphtha-based feedstock. *This does not represent at all the total cost of production of these chemicals.*

It will be seen from the table above, that there are certain areas where alcohol definitely is a better and a cheaper feedstock than naphtha derived ethylene/propylene. We have assumed here, however, that although ethylne/propylene will cost Rs. 2,500/- per tonne to make, even for captive consumption. they will charge at Rs. 3,000 per tonne to a user plant in order to ensure some sort of return on investment. Note that the products from Naphtha cracker such as ethylene, propylene, butadiene and benzene have been jointly costed at the same value mainly Rs. 3,000/- per tonne delivered to the customer.

It can he seen that the feed cost element itself is a clear indicator of the areas in which alcohol has definite advantage over naphtha/natural gas and areas in which less priorities could be given to alcohol and in fact petrochemical growth could be encouraged. Although, for example, the cost of feedstock element in manufacture of ethylene from alcohol appears to be slightly lower, the economy of size of naphtha cracker/optimum energy utilisation could well make Naphtha Cracker more viable than alcohol. Therefore, areas such as ethylene, styrene. and vinyl chloride should be given less priority and in fact for such chemicals, Naphtha/Natural Gas plants should be given preference. However, in the areas such as acetaldehyde, acetic acid, acetone, butanol, 2-ethyl hexanol definitely, the stress should be alcohol and in fact naphtha-based petrochemical units for such chemicals should not be allowed as they from the basis of unfair monopolistic competition against alcohol. It has been argued by most petrochemical units that propylene should *not* be costed at Rs. 3,000 per tonne but at almost fuel value to make either Acetone or Butanol or 2-Ethyl Hexanol more economically viable.

The time has come to look at the whole picture from international trend viewpoint and to respect propylene to the extent that it is correctly utilised. In fact, today propylene is charged at a much higher price than fuel and almost as high as ethylene in the international market purely because most of the propylene is going towards the manufactures of Polypropylene. It may therefore not be economical to divert propylene for the manufacture of chemicals which could more easily be made from alcohol thereby diverting the propylene for the manufacture of Polypropylene.

Technological Developments:

Apart from providing massive inputs for R & D for finding out alternate sources of alcohol, and to maximise production of alcohol from existing conventional sources and methods, a completely new area of research and development has to be opened up which gives rise to a revolutionary change in the technology of alcohol utilisation for the production of certain basic chemicals.

It is also known that by selective fermentation processes using the revolutionary new technique of immobilised enzymes molasses can be directly converted into chemicals like Butanol and Acetone. This should be gone into much more depths, and more processes should be discovered for direct conversion of alcohol to several other chemicals.

It may be noted that fermentation is a low energy technology, and much more appropriate to India than the utilisation of conventional technologies which require a very high energy input per unit of product produced. Conventional technologies generally use up far more steam, fuel and energy as such compared to micro organisms.

It may also be stated that alcohol is becoming increasingly important as a feedstock for the synthesis of synthetic proteins. At present it is difficult to predict what will happen within the next 10 years. However, there is a great alarming trend of rising prices of naturally produced vegetable and animal proteins. This however, as compared with inadequate R & D inputs for the manufacture of synthetic proteins make the latter still more expensive. However, the day is not far off when with the rising population, rising prices of natural proteins, and improvement in the technology of manufacture of synthetic proteins that the synthetic proteins from alcohol in huge bulks will become an attractive proposition. If this is so, then by 1990 the requirements of alcohol as indicated in this report may well increase by almost 40-50% more.

In order not to be far behind in this sphere, part of the expenditure for R & D should be spent in specific areas of fermentation technology whereby direct conversion of alcohol can take place to both edible substances as well as basic chemicals.

The Committee considered raising a fund for granting soft loans to the industry for modernisation of their plans as some of them were quite old and the entrepreneurs had not taken steps to replace them on the grounds of lack of resources. The representatives of the industry did not however favour such a proposal.

CONCLUSIONS AND RECOMMENDATIONS

A. Alcohol Industry:

(1) Our survey of the alcohol industry revealed that adequately technically qualified staff is not employed in the distilleries. Sufficient attention is not paid to the reaction parameters. There is an urgent need to employ qualified people in the distilleries to a minimum of atleast one person in each shift as a supervisor. Our survey of technical educational institutes indicates that the three year degree course in Biochemical Engineering available with H.B.T. Institute at Kanpur is suitable for such personnel.

(2) In order to follow up the implementation of modern technology in the industry, A.I.D.A. should form a technical cell and hold periodic discussions and visits to the industries. Appropriate consultants such as EIL/FEDO should be engaged by them on a periodic basis for advice on modernisation of existing plant.

(3) It is necessary to follow a standard method of calculation of efficiency. Such standard methods have been arrived at but all units are not following them. Some of the units cultivate their own culture which requires molasses as feedstock while others use ready made yeast and save the material required to produce the yeast. In addition to this there is no uniform pattern regarding taking total sugar or fermentatable sugar as the basis of calculations. In some factories the quantity of molasses is not weighed.

(4) The industry requires to modernise and remove bottlenecks in the process. Provision of instruments to measure and control temperatures, rates of flow, quantities of material put in and taken out, steam consumption etc. is required. Necessary laboratory facilities are essential. It is recommended that a cess of 3 paise per litre of alcohol be levied and the amount utilised to promote Research and Development activity for alcohol industry and alcohol-based industry.

(5) It is recommended that molasses based alcohol be totally reserved for industrial purpose. If this is not possible, then the most desirable course for the growth of alcohol based chemical industry would be to freeze the alcohol allocation to the potable liquor industry to its present level. The next best course would be to restrict the alcohol allocation to country liquor as it affects the State's revenue. For the planning of alcohol based industry on a national level, alcohol should get the same consideration as other basic feedstock like naphtha—that is to say there should be a central control.

(6) A controlling body should be formed and entrusted with the work to provide guidelines to the industry, monitor the progress of the industry, administer funds for Research & Development. The existing Central Molasses Board could be strengthened to perform these functions. The central body should draw up a five year plan on the requirements of the industry, of raw materials and finished products and an yearly plan for distribution of molasses to distilleries as well as alcohol to the indutry. Once an annual plan has been made it should ordinarily not be disturbed. The sugar factories from which the distilleries will take the molasses for the year should be ear-marked before the commencement of the season and similarly the distilleries that will supply alcohol to the industries should be earmarked. The average distance over which a distillery is required to transport molasses should preferably be within 50 kiolometre, such that there is equitable distribution of molasses distance-wise.

(7) There is enough scope to improve the yield of alcohol per tonne of molasses by implementing a few improvements which would not cost much investment. A few such suggestions are:

(a) Selection of a suitable strain of yeast to generate higher concentration of alcohol, which can stand high temperature in summer months. A mixed strain to convert the unfermentable portion of sugar can also be utilised.

5—1 M of/PC&F/ND/78

(b) Laboratory checks during the fermentation process at every stage should be carried out.

(c) Instruments for measuring, controlling and recording temperature and flow at essential stages of the process must be provided.

(d) Fermentors should be thoroughly cleaned and steamed after completion of every batch to prevent contamination i.e. thorough sterility should be maintained.

(e) Fermentors should be covered and alcohol escaping through Carbon dioxide should be recovered.

(f) The quantity of Sulphuric Acid and inorganic nutrients required for the batch should be determined by actual analysis.

(g) Heat economy at various stages should be exercised by proper design of heat exchangers and lagging of distillation columns and pipelines.

(h) Independent check on sugar percentage of molasses is absolutely essential to calculate the yield.

(i) Proper conditions of storage of molasses must be maintained.

(8) In order to encourage distilleries to improve their efficiency and utilisation of raw materials, a policy of liberal and timely allocation of molasses to units which show better actual efficiency should be followed. This can be done by ascertaining the physical quantities of molasses consumed and alcohol produced.

(9) While planning a new distillery the availability of molasses in the region should be ascertained. The cost of transport of molasses should be kept to the minimum.

(10) It is preferable to attach a distillery to the sugar factory to take the advantage of the utilities available and the other off-site facilities. The cost of production of alcohol of distilleries attached to sugar factory will be lower.

(11) The multiplicity of taxes and levies and administrative control by Government agencies has been criticised right from the 1955 report. It would be advisable to have separate units for manufacture of potable liquor and industrial alcohol. This should be gradually done over a period of years. There is no justification for having different rates of taxes in different states. Alcohol should be considered as a basic feedstock material like Naphtha and should be available at a uniform price all over the country. This matter requires serious and immediate attention. This is an artificial barrier causing hindrance to the progress of industry.

(12) It is desirable to utilise sugar cane and its by-products economically. At present 60% of the sugar cane is utilised for Gur and Khandsari. The sugar extraction is poor and sugar is lost in bagasse and control on by-product utilisation is not easily possible. More and more sugarcane should be diverted to sugar factories and Khandsari molasses sould be used for distillation so that finally it will enhance the production of alcohol.

(13) Small size distilleries below 10-12 million litres per year should not be encouraged except when they are attached to sugar factories.

(14) The raw-material for potable liquor, at least for Indian made foreign liquor must be obtained from alternative sources such as grains, starches etc.

(15) The price of molasses should be brought down to keep the price of alcohol at the lowest level. The amount of Rs. 20/- per tonne of molasses provided at present for the construction of storage tanks for molasses should be discontinued from the price of molasses. Instead a cess of Rs. 0.03 (3 paise) per litre, should be levied on the price of alcohol to provide funds for research and development work both in the distillery industry as well as alcohol-based chemicals industry. The bare price of molasses could still further be reduced. This is imperative for the growth of alcohol-based industry.

(16) Alcohol should preferably be used as a chemical feedstock and not as a fuel, for motive power or as a source of energy because its calorific value per unit weight is very low.

(17) At present, the Central Molasses Board meets once in a year at the beginning of the sugar season. There should be another meeting in the middle of the season to review the situation so that any surplus molasses could be transported to the required ditilleries before the start of the rainy season.

(18) The distribution of alcohol is controlled by the State Government although the Central Government intervenes in allocation of alcohol from surplus to deficit States. The procedure followed causes lot of difficulties to the users. For release of alcohol, licence holder has to submit an application for a particular month's quota to Excise Commissioner who issues release order. On the basis of releae order, the Excie Superintendent of the Ditrict gives a transport permit. After utilising the quota released in a permit, the licence holder has to submit another application for the release of the next month's quota. The same distillery may not be allotted from month to month. This situation needs rationalisation.

(19) While licensing new units, the availability of molasses within the region should be taken into consideration. Also preference should be given to existing units to expand as there is already adequate infrastructure available within the existing units.

(20) As an incentive to the distillers to produce alcohol more efficiently it may be worthwhile to allow the efficient distilleries who produce during the season at 240 litres per tonne of molasses to export about 5% of alcohol produced.

(21) Established units in alcohol deficit States are finding great difficulty to maintain supply of alcohol because the surplus States are setting up alcohol based units to utilise their surplus alcohol. The well established units in deficit States must be assured of supply of alcohol without any interruption. This should be carefully kept in view while approving the further capacities.

B. Alcohol-based Chemical Industries:

(1) The alcohol-based industries must be assured or their full requirements of alcohol before new units are licensed. In the case of alcohol deficit States, the surplus States that are required to release alcohol should be clearly marked and excessive distance for transport of alcohol be eliminated.

(2) The supply of alcohol to the industries should be regular and the procedure of submitting returns month by month and getting fresh quota should be done away with. Annual quota should be released. It should be appreciated that all alcohol-based industries are continuous industries and if shut down for any reason result into loss of efficiency and loss of alcohol in start-up and shut down. This is a national waste.

(3) It is better to allocate the total production of individual distilleries to individual alcohol-based industries for a minimum period of one year from time to time so that other formalities like denaturants, transport permit and release order are planned.

(4) Industries which require relatively more alcohol per tonne of product should be given lower priority. However, the present units may be allowed to have a 3 to 4% annual growth rate. In remote places where petrobased ethylene is not available alcohol-based ethylene units may be permitted.

(5) Apart from extensive Research and Development work for finding out alternate sources of alcohol and maximising production of alcohol from existing conventional sources, research and development work must be undertaken in the new avenues of fermentation technology in selective fermentation processes using the revolutionary new technique of immobilised enzymes. Alcohol can be directly converted into chemicals like Butanol & Acetone. The low energy technology is much more appropriate to India than the utilisation of conventional technologies.

NOTE OF DISSENT BY THE REPRESENTATIVE OF ALL INDIA DISTILLERS' ASSOCIATION, NEW DELHI, AS A MEMBER OF THE COMMITTEE SET UP BY THE GOVT. OF INDIA, MINISTRY OF CHEMICALS & FERTILIZERS TO CONDUCT STUDY AND MAKE RECOMMENDATIONS FOR THE DEVELOPMENT OF ALCOHOL BASED INDUSTRIES.

I am signing the report of this Committee subject to my note of dissent given below:

1. The terms of reference for this Committee clearly stipulate that this Committee should prepare the present status of the *industries based on alcohol* i.e. the total approved capacities, actual installed capacities and the production achieved. The Committee has to work out the estimates of the capacities likely to materialise by the end of 5th Plan i.e. 1978-79 and to assess long-range estimates for a period of—say 15 years and to recommend specific areas of alcohol based industries, in which future growth needs to be planned. The Committee is to further examine the constraints on the development and growth of the alcohol based industries and recommend suitable remedial measures. Besides, the Committee has been asked to make any other recommendation which may help in increasing the availability and utilisation of alcohol for industrial purposes.

2. Unfortunately the report, which has been finalised, does not deal with the subjects as envisaged in the terms of reference. The Committee has not collected any reliable and adequate data from the alcohol based industrial units regarding consumptions of raw materials for the past few years, theoretical production possible from the quantities of raw materials consumed, actual production achieved, efficiencies possible and actual efficiencies achieved etc. Data regarding the technical working of these units has also not been collected. In the absence of these figures, it is not possible for the Committee to give their comments on the *present status of the alcohol based industries.* The reports primarily deals with the condition of Alcoliol Industry and not Alcohol based Industries. Even here, the Committee has not collected basic data regarding the actual number of distilleries existing in this country, their present licenced/ installed capacities, the actual production of each distillery for the past five years, their efficiencies and the problems being faced by them with regard to the availability of adequate quantity of proper quality of raw materials etc. They have commented upon the working of the Alcohol Industry not based on data collected, but have given their comments based on—somewhat prejudiced view of the working of this industry.

3. Even though our Association had intimated to them that there are 101 distilleries *in porduction* with a licenced capacity of about 604 million litres, they have mentioned that there are only 71 distilleries in production *as per D.G.T.D. records* which also is contradictory as per data given in Appendix-8 where the number of distilleries is mentioned as 83 with a licensed capacity of 508 million litres. It is well within their knowledge that there are number of units which have been licensed by the State Excise Commissioners and have not so far been registered with D.G.T.D. The Committee should have assessed the installed capacities of the various units as well. The Committee Secretariate should have taken the trouble of collecting all the latest data regarding the number of distilleries and their present capacities by contacting the various Excise Commissioners of the States concerned. This, according to me, has been a lapse in this report. Without this important data, it is very difficult to prepare a report indicating the present status of this industry and the possible production which can be achieved in the next few years.

4. It has been mentioned that during the last 30 years the distilleries have been working at a very low standard of efficiency and there has not been any improvement in their working. This statement is not based on any data collected for the past 30 years but is based on prejudiced opinion. In fact, from the data available with the All India Distilleries' Association, the recovery of

rectified spirit has gone up from 222 to 229 litres per tonne of molasses from 1972 to 1976. In fact, the recovery of alcohol per tonne of molasses is dependent on a number of factors such as quality of molasses, total fermentable sugar in molasses, continuous operation of distillery etc. etc. This also depends on continuous supply of power, quality of coal to maintain steam pressure etc.

5. It has also been mentioned that alcohol indstry is letting out effluent without any treatment which can cause enough pollution. I submit that this subject is outside the purview of the terms of reference. The factual position is that the All India Distillers' Association has collected from its members large amounts and have given the same to various Research Institutions like N.S.I., Kanpur for working out a proper and economic solution of the problem. Some distilleries have already adopted lagooning method for treatment of effluent. Others have requested their State Governments to allot them land for this purpose. It may be further pointed out that nothing has been mentioned regarding the effluent being let out by the *alcohol based industry*. The report could deal with the problem of Effluents being let out by the Alcohol Based Industry as per terms of reference but unfortunately the report is silent on this.

6. The report does not deal with the problem of inadequate lifting of alcohol from distilleries which resulted in frequent stoppages of distilleries due to warehouse jamming. This has been one of the reasons for poor utilisation of installed capacities of the distilleries. The report does not deal with the requirement of adequate storage capacities for Alcohol with the Alcohol consuming units, the present position and the steps to be taken to augment the same, if necessary.

7. In the report it has been mentioned that there is no adequate technical control in the distillery. It is not fair to make such a sweeping remark against the distilleries without collecting any data from the distilleries in this regard and studying them carefully. There has been gradual improvement in production, efficiencies and other working data of the distilleries. The recovery and other efficiency figures would greatly depend upon the fermentable sugar in molasses. Without collecting and studying these data, it is not fair to come to any conclusion.

8. It has also been mentioned in the report that it is possible to convert non-fermentable sugar by enzymatic action. It would have been desirable if the details of the process of fermentation of non-fermentable sugar or the reference from literature giving the details of the process could have been given in the report to enable the distilleries to benefit by this information.

9. The efficiency of conversion of alcohol into various alcohol based chemicals is very important in the present context and unfortunately the Committee has not collected any data regarding the present conversion efficiency of alcohol into various alcohol based chemicals, what is the theoretical efficiency possible and where the industry stands at present. It is quite possible that the alcohol consuming industry could improve their converion efficiencies by better process control and technology.

10. It is common knowledge that alcohol prices have been very uneconomic to the alcohol units during the past few years and due to which the industry has not been in a position to undertake any modernisation programme or technological improvements. Any proposal for any increase in alcohol prices has always been strongly opposed by the alcohol consuming industry. It would have been a very good exercise if this Committee had collected data pertaining to the percentage incidenee of the existing ex-factory price of rectified spirit excluding taxes namely Rs. 589.1 per K.L. to the final sale price of their end products to the actual consumers. Unfortunately, the Committee has not though it fit to collect such useful data which would be handy to the Government whenever this question comes up again in future.

11. It has been mentioned in the report that the yield of alcohol produced in Brazil from sugar factory molasses is 300 litres per tonne. It has been conveniently omitted to mention that the sugar content of molasses in Brazil is over 66% whereas the sugar content of molasses in India is around 45% to

47%. Actually, the purity of final molasses in India is around 35% whereas the same in Brazil goes upto 60%. In Brazil, they are deliberately throwing out molasses rich in sugar since their policy has been to produce more alcohol and less sugar whenever the international price of sugar goes down. This is the position today and in Brazil they sacrifice efficiency of recovery of sugar in the sugar factory and pass on molasses of higher sugar content to the distillery to recover more alcohol, with a view to save foreign exchange in importing crude oil. In Brazil, the official policy has been to replace petrol by power alcohol and as such the Government is giving a lot of encouragement for producing alcohol directly even from cane juice. If these facts are not mentioned, it is likely that inadequate data will mislead the authorities concerned. Our Association has recently sent a delegation to Brazil to study the working of distilleries and shortly a report in this regard will be submitted to the Government comparing their efficiencies and our efficiencies.

12. According to the Committee the delivered cost of alcohol on the present day basis has been suggested to be in the region of Re. 1 per litre to the user. This suggestion has been made without any study or supporting data. I am of the view that it is not possible because molasses and alcohol transport charges vary from distillery to distillery and consumer to consumer. With the allotment of molasses entirely in the hands of the State excise authorities, a uniform delivered price is not practicable. As at present, the molasses transport charges should be computed on actual basis, and reckoned as an incidence on the production of alcohol without any ceiling.

13. It has been recommended that a "Cess" of 3 paise per litre of alcohol may be realised and the amount be utilised to promote research and development activities. It is strange that the alcohol based industry want to utilise the "Cess" to be collected by Alcohol Industry. As far as alcohol industry is concerned, it fully supports the idea of collecting a separate "Cess" and apportioning the same for R&D activity for the alcohol industry after payment of taxes, if leviable. Similarly the alcohol based industry should have come forward to collect "Cess" out of the sale of their products rather than depending on alcohol industry for their R&D activities to be controlled by the Government and the alcohol industry only. Our Association is strongly opposed to any suggestion wherein the money collected by the alcohol industry is proposed to be utilised by the alcohol consuming industry.

14. The Committee has made a reference to the yield of alcohol from molasses in Brazil but has not discussed the reason as to why Brazil is going in a big way for promoting the use of power alcohol for motive purpoes. In this regard, our country is also more or less similarly situated and we are already spending considerable foreign exchange in import of crude. We have to seriously study the reasons which led Brazil to encourage the use of alcohol as motor fuel and find out whether the same policy will suit our country also.

15. It has been recommended by the Committee that efficient distilleries who produce during the season 240 litres per tonne of molasses may be permitted to export 5% of alcohol produced by them, without mentioning the sugar content of molasses which will be made available to the distillery concerned. This suggestion is vague. I agree with the spirit of the suggestion but the recovery of alcohol should have some relation to the sugar content of molasses. The base recovery should be 220 litres per tonne of molasses, based on the present performance.

16. The report has been made unnecessarily bulky by incorporating copies of all the representations received from various individuals/organisations. It is not a normal practice to include such papers in the final report of the Committee. These background papers and representations are meant for study by the members Committee and only the recommendations of the Committee alongwith supporting data should find a place in the report.

17. One of the graphs included in the report give a wrong impression. I would like to make a reference to the trend curves given for the price of alcohol and molasses. The alcohol prices have been increased only a few times and the recent steep increase was entirely due to increase in molasses price. These

trends should have been indicated by a straightline joining the adjacent two points and not by a curve which is likely to mislead the authorities concerned. Besides, in the same graph both the graphs for alcohol and molasses have been given. The range of increase in prices of molasses is Rs. 10/- to Rs. 60/- (500%) and the range of increase in prices of alcohol from Rs. 200/- to about Rs. 600/- (200%). Even though the percentage increase in molasses is far higher than the percentage increase of alcohol price, the graph does not reflect this position correctly to a layman. The reason being that they have adopted the same scale even though the range of prices has been from Rs. 10/- to Rs. 60/- for molasses and from Rs. 200/- to about Rs. 600/- for alcohol. They should have used two different scales to represent the real picture regarding the extent of the percentage increase in the prices of these two commoditics.

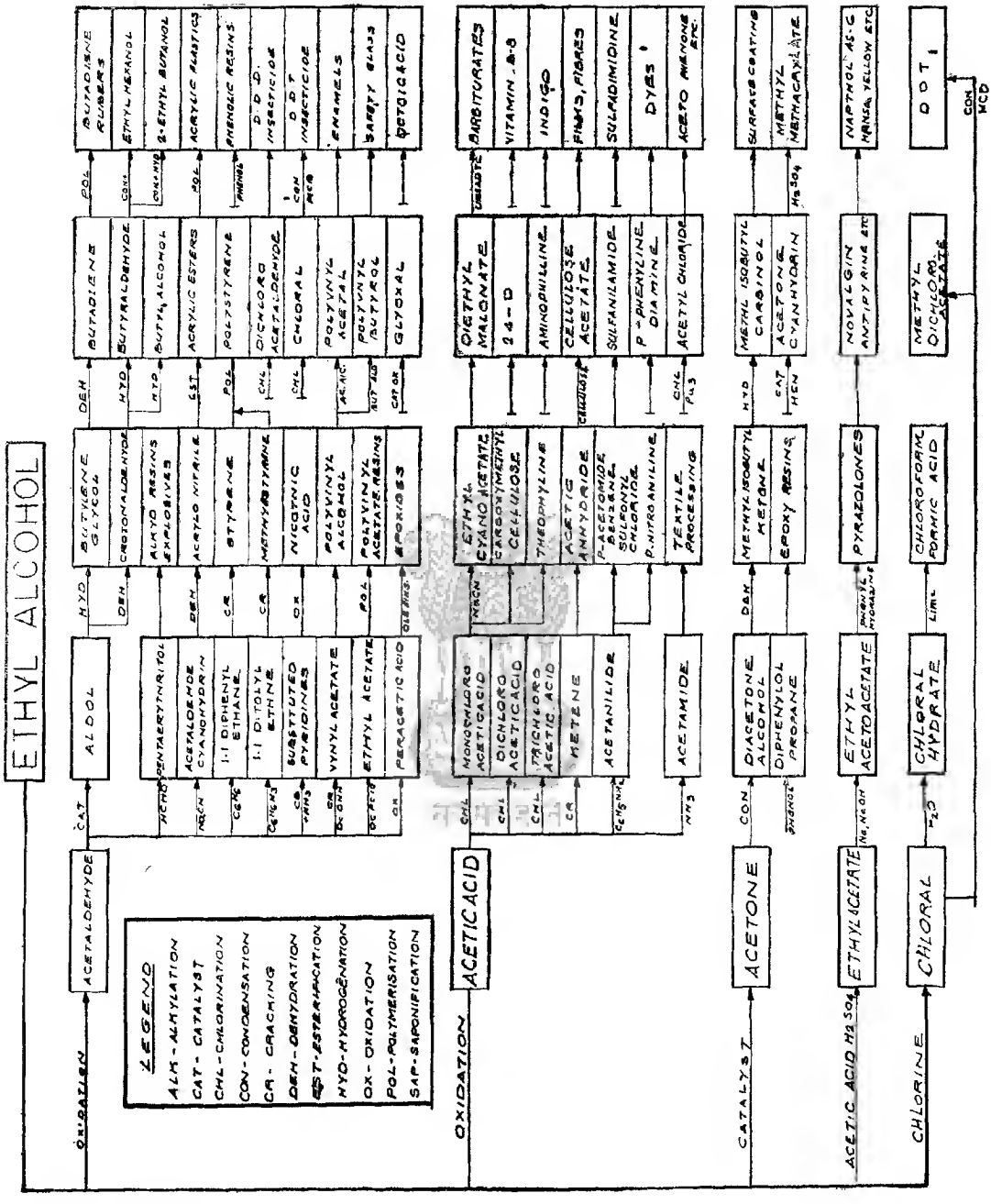
18. Our Association strongly supports the suggestion that a part of molasses price be funded as a sort of a "Cess" for Research and Development in Alcohol Industry. This fund should be jointly operated by the Alcohol Industry and a body which may be appointed by the Government of India.

For ALL INDIA DISTILLERS' ASSOCIATION

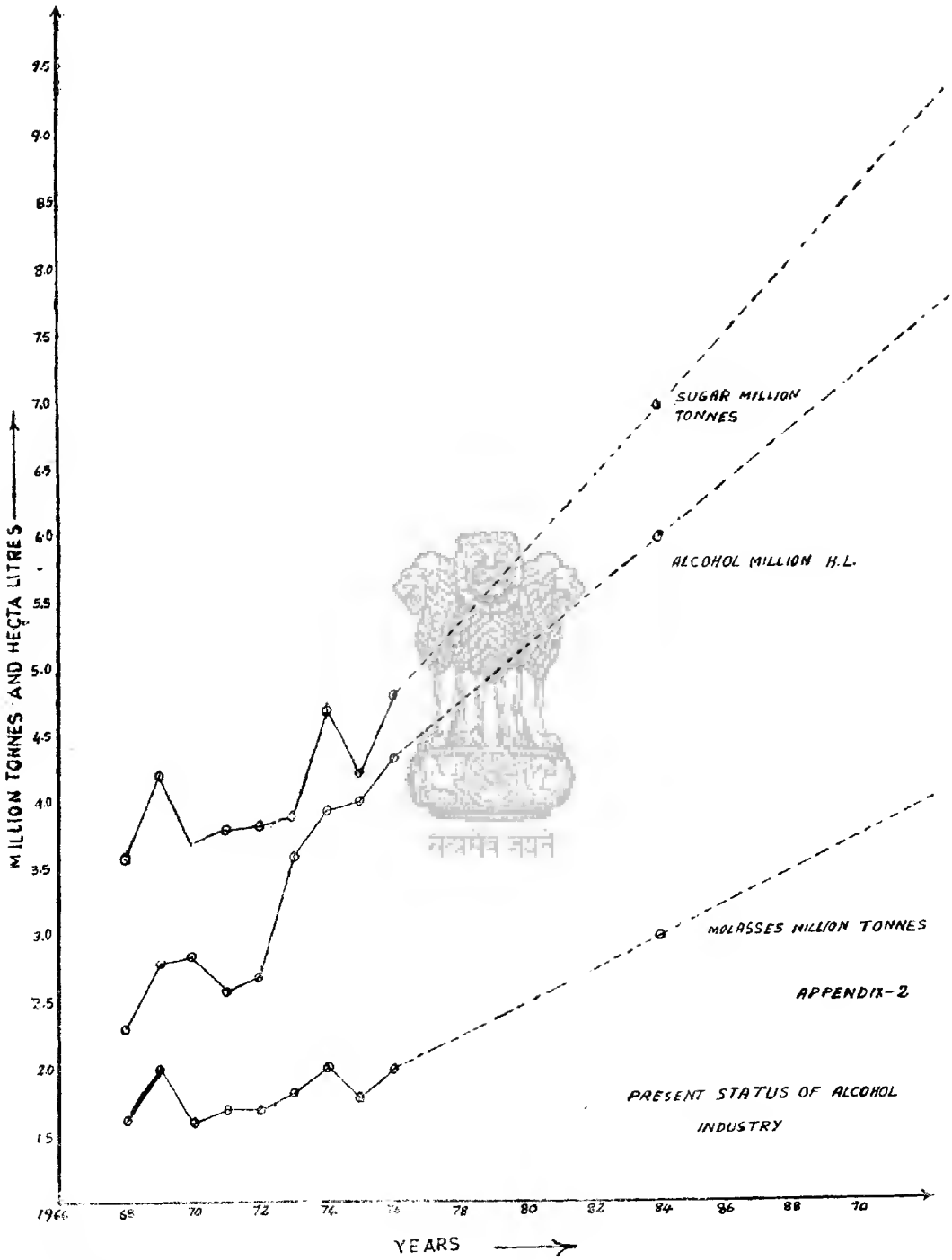
(S. P. SETH)

Chairman 'AIDA Northern Zone'

For President, A.I.D.A.

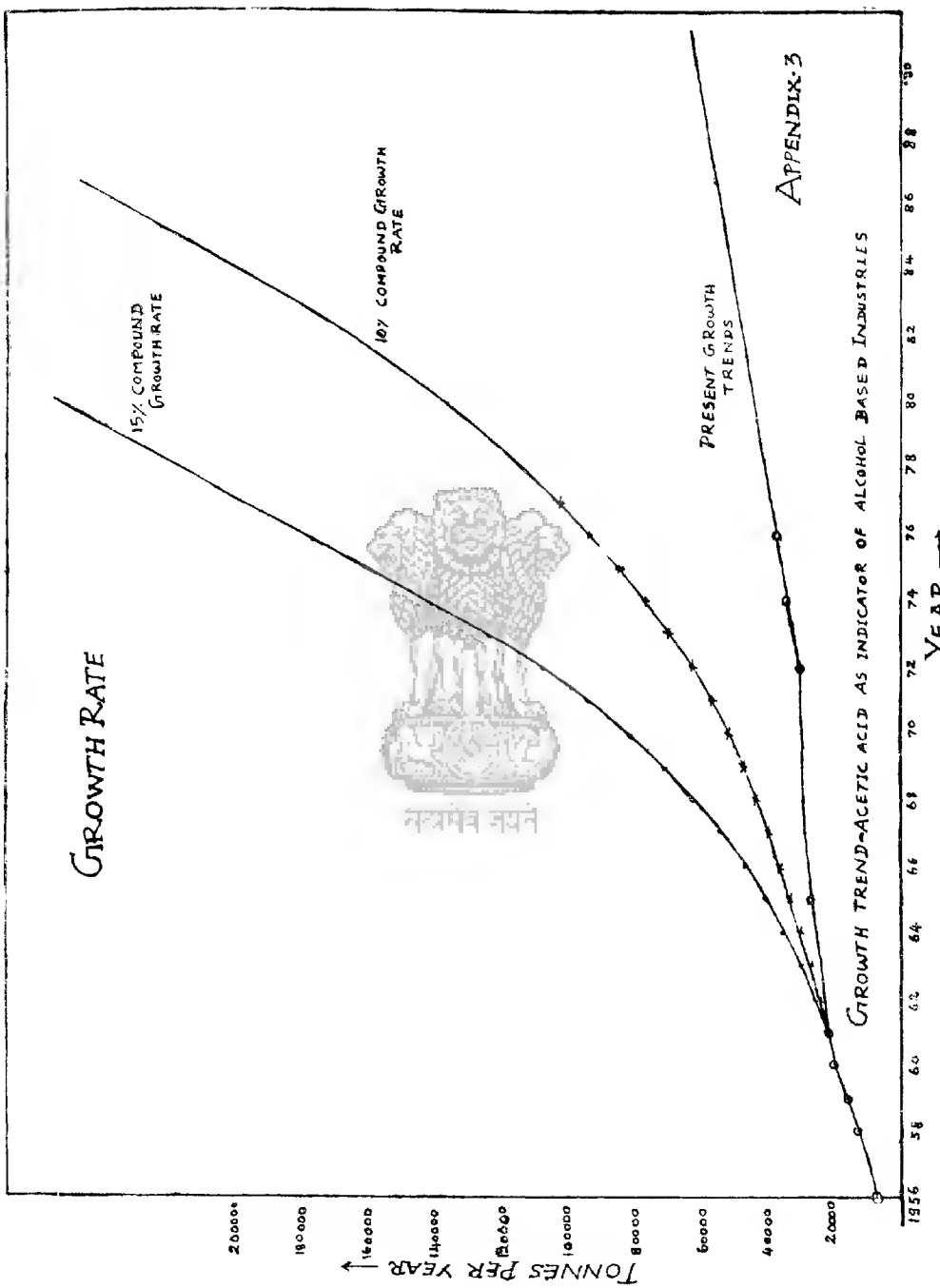


1 M of PC&F/ND/78

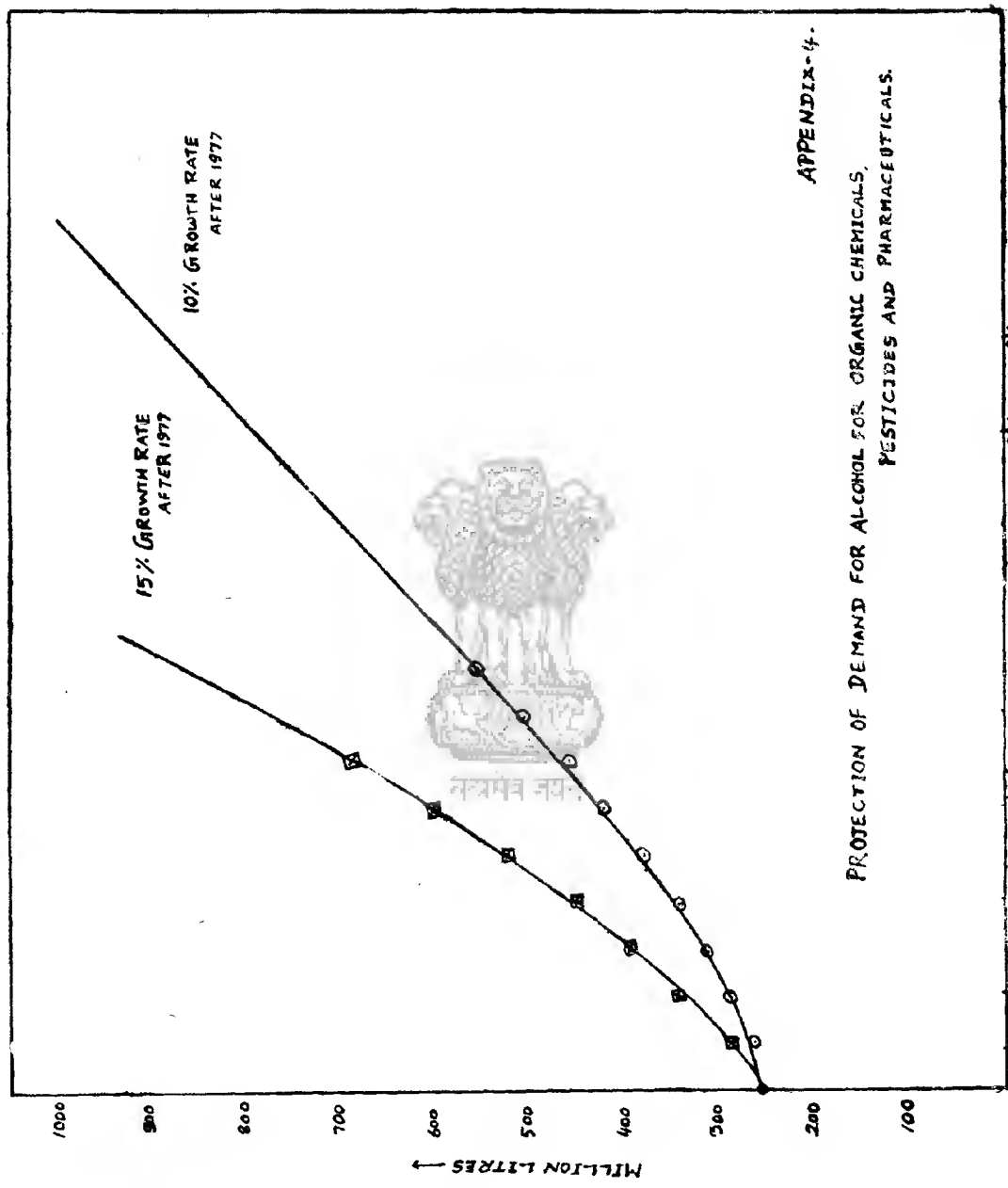


1 M of PC&F/ND/78

Facing Page 33-B



Facing Page 33-C



1 M of PC&F/ND/78

Statement Showing the Statewise Total Number of Licenced and Installed Sugar Factories During 1976-77 Season

State	Total No. of existing licenced sugar factories				Total No. of installed sugar factories			
	Private	Public sector (State owned)	Coop	Total	Private	Public sector (State owned)	Coop	Total
1. U. P.	63	11	23	97	62	7	10	79
2. Bihar	27	1	2	30	27	1	2	30
3. Punjab	2	2	4	8	2	..	4	6
4. Haryana	1	..	4	5	1	..	4	5
5. West Bengal	1	1	..	2	1	1	..	2
6. Assam	..	4	1	5	1	1	..	2
7. Nagaland	—	1	—	1	—	1	—	1
8. Rajasthan	1	1	1	3	1	1	1	3
9. Madhya Pradesh	5	—	2	7	5	—	1	6
10. Orissa	1	—	2	3	1	—	2	3
11. Maharashtra	11	—	68	79	11	—	51	62
12. Gujarat	—	—	16	16	—	—	10	10
13. Goa	—	—	1	1	—	—	1	1
14. Tamil Nadu	10	6	9	25	10	1	9	20
15. Karnataka	8	3	16	27	8	2	9	19
16. Pondicherry	1	—	1	2	1	—	—	1
17. Andhra Pradesh	10	8	21	39	10	3	11	24
18. Kerala	1	—	2	3	1	—	2	3
19. Manipur	—	1	—	1	—	—	—	—
	142	39	173	354	141	18	118	277

Annual sugar capacity in lakh tonnes

	Licenced	Installed
Private sector	29,069	24.290
Public sector	6.275	2.975
Co-operative sector	37.930	24.265
TOTAL	* 73.274	51.530

*In addition to this, capacity registered under liberalised policy (18 expansions) is 1.61 lakh tonnes. Total licensed capacity 73.274 + 1.61 = 74.884 lakh tonnes. Out of 18 expansions Girna (0.08 lakh tonnes) has completed expansion. Effective exapansion cases under liberalised policy are 17. (Source Sugar Directorate).

Statewise Estimates of Sugar, Molasses and Alcohol
(Source : Ministry of Chemicals & Fertilizers)

Name of the State	Sugar (lakh tonnes) 1976-77	1983-84	Molasses (lakh tonnes) 1976-77	1983-84	Alcohol (m. litres) 1976-77	1983-84
1. U. P.	13.65	17.86	6.30	7.13	140.00	156.00
2. Bihar	3.39	3.60	1.00	1.44	19.5	31.68
3. Punjab	0.55	1.12	0.22	0.47	3.96	8.50
4. Haryana	0.93	1.22	0.55	0.70	11.5	15.40
5. Maharashtra	15.64	20.59	5.50	8.23	110.0	181.00
6. Gujarat	2.80	4.535	0.91	1.81	13.5	30.00
7. Tamil Nadu	4.6	7.12	1.65	2.84	30.50	62.48
8. Andhra Pradesh	3.66	6.91	1.92	2.76	44.85	68.00
9. Karnataka	4.32	7.64	1.67	3.05	32.0	67.10
					405.81	620.16

Conclusions :

(1) Bihar may not have any surplus for other States after I.D.P.L. plant comes into production.

(2) The deficit of Andhra Pradesh will be somewhat low.

(3) TN may also not be able to spare any alcohol after the TNIDC unit of chemicals requiring 16 ML comes into operation.

6—1 M of PC & F/ND/78

Statewise Production of Sugar and Molasses
(Ref: Sugar News)

	Sugar Production in thousand tonnes			Molasses Production in thousand tonnes		
	73-74	74-75	75-76	73-74	74-75	75-76
1. Assam	7	7		3.2	2.9	3.4
2. Andhra Pradesh	287	397	326	132.0	166.7	136.9
3. Bihar	223	212	177	102.6	89.0	74.3
4. Gujarat	176	161	115	80.9	67.6	48.3
5. Haryana	94	114	107	43.2	47.9	44.9
6. Kerala	26	19	7	11.9	8.00	2.9
7. Maharashtra	955	1515	1606	439.3	636.3	674.5
8. Madhya Pradesh	22	57	48	10.1	23.9	20.2
9. Karnataka	284	336	361	130.6	141.1	151.6
10. Orissa	9	13	9	4.1	5.5	3.8
11. Punjab	67	77	83	30.8	32.3	34.8
12. Pondicherry	26	24	17	11.9	10.1	7.1
13. Rajasthan	21	30	33	9.6	12.0	13.8
14. Tamil Nadu	443	384	177	203.8	161.3	74.3
15. Uttar Pradesh	1296	1431	2332	596.2	601.0	979.4
16. West Bengal	87	10	10	40.0	4.2	4.2
17. Others	3	7	12	1.4	2.9	5.0

LIST OF DISTILLERIES LICENSED/REGISTERED WITH DGTD AS ON 31-10-1977

	Annual Capacity As per DGTD's Books (K. L.)
ANDHRA PRADESH	
1. A. P. Govt. Power Alcohol Factory, Shakarnagar.	10,365
2. Andhra Sugars Ltd., Tanuku.	3,637
3. Ankapalli Co-op. Sugar Industries Ltd., Thummapala-Anakapalli.	655
4. Deccan Sugar & Abkhari Co. Ltd., Samalkot.	2,188
5. Government Distillery, Narainguda.	2,046
6. Hindustan Polymers Ltd., Vishakhapatnam.	6,801
7. K.C.P. Limited, Vuyyuru.	4,637
8. Shri Sarvaraya Sugars Ltd., Chelluru.	2,182
9. Shri Rama Sugars & Ind. Ltd., Bobbili.	1,364
BIHAR	
10. Cawnpore Sugar Works Ltd., Marhewrah.	1,864
11. New Swadeshi Sugar Mills, Narkatiagunj.	4,364
12. S. K. G. Distillery, Lauriya.	9,000
13. S. K. G. Distillery, Mirganj.	4,309

14.	Bihar Distillery, Pachrukhi.	2,274
15.	Ranchi Distillery, Ranchi.	1,718
@16.	Lakshmi Narain & Sons, Samashtipur.	8,500
	GUJARAT	
17.	Gujchem Distillers India Ltd., Bilimora.	6,000
18.	Shree Bileshwar Khand Udyog Khedut Sehakari Mandli Ltd., Kodinar.	3,240
@19.	Yeast Alco Enzymes Ltd., Palitana (Palitana).	5,400
20.	Alembic Chemical Works Co. Ltd., Baroda.	3,137
@21.	Sun Engineering Corp., Ahmedabad.	6,000
	HARYANA	
22.	Haryana Distillery, Yamunanagar.	5,455
23.	Karnal Distillery Co. Ltd., Karnal.	982
	KARNATAKA	
@24.	Nandi Breweries & Distilleries, Bangalore.	5,255
25.	Mysore Sugar Co. Ltd., Mandya.	5,455
26.	Pampasar Distillery, Hospet.	4,910
27.	Ugar Sugar Works Ltd., Ugar Khurd.	6,819
28.	Khoday Distillery P. Ltd., Bangalore.	500
	KERALA	
29.	McDowell & Co. Ltd., Shertallay.	1,091
30.	Polsons Distillery, Chalakudi.	818
31.	Travancore Sugar & Chem. Ltd., Tiruvalla.	1,730
	MADHYA PRADESH	
32.	Bhopal Sugar Ind. Ltd., Sehore.	818
33.	Cox Distillery, Newgong (M.P.).	1,091
34.	M. P. State Ind. Corpn. Ltd., Ratlam.	4,910
	MAHARASHTRA	
35.	Maharashtra Distilleries Ltd., Chikalthana.	2,200
36.	The Brihan Maharashtra Sugar Syndicate Ltd., Shreepur.	5,455
37.	Government Distillery, Chitali.	12,274
38.	Kolhapur Sugar Mills Ltd., Kolhapur.	5,455
39.	Polychem. Ltd., Nira.	5,455
@40.	Rahuri S. S. K. Ltd., Shrishivajinagar.	4,300
41.	Shekari S. S. K. Ltd., Sangli.	5,728
@42.	Shree Satpuda Tapi Parisar S. S. K. Ltd., Purushottamnagar.	4,500
43.	Somaiya Organo Chem. Ltd., Sakarwadi.	6,819
44.	Tilaknagar Distilleries, Tilaknagar.	4,910
45.	United Co-operative Distillery, Parite.	5,400
46.	Walchandnagar Industries Ltd., Bombay.	4,091
@47.	Terna S. S. K. Ltd., Dhoki.	4,500

	PUNJAB	
48.	Bhagat Industrial Corpn. Ltd., Khasa.	2,727
49.	Jagatjit Industries Ltd., Jagajitnagar.	4,510
	RAJASTHAN	
50.	Ganganagar Sugar Mills Ltd., Sriganganagar.	851
51.	Udaipur Distillery Co. P. Ltd., Udaipur.	1,364
	TAMIL NADU	
52.	Arvind Distillery & Chem. Ltd., Kadampuliyur.	9,000
53.	Coimbatore Distillery (Dist. Coimbatore).	7,000
54.	E.I.D. Parry Ltd., Nellikuppam.	4,527
55.	Sakthi Sugars Ltd., Coimbatore.	6,000
56.	Trichy Distilleries & Chem., Tiruchirapalli.	9,000
	WEST BENGAL	
57.	Carew & Co. Ltd., Asansol.	3,382
58.	Eastern Distilleries P. Ltd., Calcutta.	2,455
59.	Shaw Wallace & Co. Ltd., Bhadrakali.	982
	UTTAR PRADESH	
60.	Ahudhia Distillery, Rajakasahaspur.	6,950
61.	M/s. Alco-Chemical Ltd., Asonhara.	12,002
62.	Captainganj Distillary, Captainganj.	15,456
63.	Carew & Co. Ltd., Rosa.	2,046
64.	Central Distillery & Breweries, Mecrut.	6,000
65.	Co-operative Distillery, Saharanpur.	818
66.	Daurala Sugar Works, Daurala.	20,475
67.	Hindustan Sugar Mills Ltd., Golagokaran.	20,475
68.	Karamchand Thapar & Bros., Unnao.	2,046
69.	Kesar Sugar Works Ltd., Baheri.	10,229
70.	Modi Distillery, Modinagar.	4,546
71.	Mohan Meakin Breweries Ltd., Lucknow.	1,637
72.	Mohan Meakin Breweries Ltd., Mohannagar.	1,000
73.	Narang Industries Ltd., Nawabganj.	6,000
74.	Oudh Sugar Mills Ltd., Hargaon.	7,637
75.	Rampur Distillery & Chem. Co. Ltd., Rampur.	13,650
76.	Saraya Distillery, Sardarnagar.	15,458
77.	Pilkhani Distillery & Chem. Works, Pilkhani.	5,455
78.	Shamli Distillery & Chem. Works, Shamli.	5,455
79.	Sir Shadi Lal Distillery & Chem. Works, Mansurpur.	6,819
80.	Simbhaoli Ind. P. Ltd. Simbhaoli.	3,410
@81.	P.V.K. Distillery, Dhanipur.	11,000

@ nformation about commencement of production not received in DGTD.

APPENDIX—9

Production Data of Sugar, Molasses and Alcohol
(Source : 'Sugar News' and DGTD)

Year	Sugar (million tonnes)	Molasses (million tonnes)	Alcohol (million litres)
1968-69	3.558	1.670	233.02
1969-70	4.261	2.004	284.09
1970-71	3.740	1.602	285.10
1971-72	3.872	1.696	259.78
1972-73	3.872	1.696	271.28
1973-74	3.949	1.825	357.00
1974-75	4.794	2.015	394.70
1975-76	4.262	1.800	408.60
1976-77	4.800	2.000	438.00
1984 (estimate)	7.000	3.000	600.00

APPENDIX—10

Variation in Operational Efficiency

Nature of efficiency	1965 inquiry %		1969 inquiry %		1973 inquiry %		1977 inquiry %	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1. Fermentation efficiency	71	96	70	92	74	89	74	86
2. Distillation efficiency	95	98	69	99	72	99	80	98
3. Overall efficiency	72	88	58	89	62	86	73	83
4. Total yield of alcohol per tonne of molasses (litres)	193	256	172	269	137	256	190	240

Figures for 1965, 1969 and 1973 from 1975 Tariff Commission Report.

APPENDIX—11

Percentage of Sugarcane Production Utilised
(Ref : Sugar News)

Year	Production of white sugar	Seed feed and Chewing etc.	Gur and Khandsari
1960-61	28.2	12.5	59.4
1961-62	26.9	12.2	60.9
1962-63	22.6	12.1	65.3
1963-64	24.7	12.0	63.3
1964-65	27.4	11.9	60.7
1965-66	29.4	11.8	58.8
1966-67	23.3	12.0	64.7
1967-68	23.7	11.8	64.5
1968-69	30.2	12.0	57.8
1969 70	33.9	12.1	54.0
1970-71	30.2	11.8	58.0
1971-72	27.3	11.9	60.8
1972-73	32.4	12.0	55.6
1973-74	30.7	12.0	57.3

Levies on Industrial Alcohol Consumed within the State

Ref : Jalan Committee Report

(Rs./bulk litre)

Srl. No.	Levies	U.P.	Bihar	West Bengal	Maharashtra	Tamil Nadu	Andhra Pradesh	Gujarat	Haryana
1.	Administrative charges	@0.075	—	—	—	—	—	—	—
2.	State sales tax	—	7%(a)	—	15%	8%	6.63%	15%	6%
3.	State excise duty	—	—	—	—	0.16	0.20(c) 0.15(d)	—	11.20(e)
4.	Surcharge on sales-tax	—	1%	—	—	5%	—	1.5%	2%
5.	Special fees	—	—	—	0.41(f)	—	—	0.41(e)	—
6.	Gallanage fee	—	0.75	—	—	0.10(e)	—	—	—
7.	Pass fee	—	—	0.10(g) 1.60(b)+(d)	—	—	—	—	—
8.	Permit fee	—	—	—	—	—	—	—	2.00(g)
9.	Entry fee	—	—	7%(c) 3%(g)	—	—	—	—	—
10.	Transport fee	—	—	—	0.05	—	—	0.22(e)	—
11.	Vend fee	1.10(d)£	—	200(c) 100	—	—	—	0.17(d)	—
12.	Purchase tax	0.40 0.20	—	—	—	—	—	—	—
13.	Countervailing duty	—	—	—	—	—	1.10(h)	—	—

Note: Specific rates are per bulk litre.

(a) On Denatured and rectified spirit.

(b) On Absolute alcohol.

(c) On rectified spirit

(d) On denatured spirit

(*) 40 paise up to 1 million litres and 20 paise over 1 million litres

•But stayed by Allahabad High Court.

But stayed by Allahabad High Court.

** Upto 10,000 bulk litres, thereafter Rs. 10 per kilolitre extra for special denatured spirit.

@ On Synthetics and Chemicals Ltd. only

£ Since struck down by Allahabad High Court.

(e) On rectified spirit & absolute alcohol.

(f) When issued on payment of duty only.

(g) On Special denatured spirit only.

(h) On imported alcohol only.

Levies on Industrial Alcohol Exported to other States

Ref : Jalan Committee Report

(Rs./bulk litre)

Sr. No.	Levies	U.P.	Bihar	* West Bengal	Maharashtra	Tamil Nadu	* Andhra Pradesh	* Gujarat	* Haryana
1.	State excise duty	—	—	—	—	0.50(a)	—	—	—
2.	Gallanage fee	—	—	—	—	0.25(c)	—	—	—
3.	Pass fee	1.75(b) 0.25(c)	—	—	—	—	—	—	—
4.	Export fee	—	0.75(c) 0.25(d)	—	0.25	—	—	—	1.00(d) 1.60(a)
5.	Central sales tax	4%	4%	—	4%	4%	—	—	4%

Note : Specific per bulk litre.

(a) On Rectified spirit and absolute alcohol.
(b) Per alcoholic litre on rectified spirit.
(c) On denatured spirit.
(d) Special denatured spirit.
(*) Generally deficit States.

Capacities of Alcohol-based Products

PRODUCTS	Capacity/ TPA	Requirement of Alcohol for full utilisation of capacity	
		Existing Units	New Units
1	2	3	4
ACETIC ACID (Licensed/Regd. capacity)			
1. Sirsilk , Sirpur, AP	3100		
2. Somaiya Organo Chem., Sakarwadi	6000		
3. AP & Devp. Corporation, Hyderabad	1680		
4. Andhra Sugar, Tanaku	1080		
5. Kolhapur Sugar Mills	2400		
6. Union Carbide India Ltd.	1360		
7. Indian Organic Chem., Khopoli	9000		
8. Mysore Sugar Co. Ltd., Mandya	3000		
9. Somaiya Organics India Ltd., Barabanki	7600		
10. Gujchem Distillery Ltd.	3000	@ 1430 Litre /ton	
	38220	54,654,600	
New Units licensed (Letter of Intent/licensed)			
1. I.P & Investment Corporation of Orissa	3300		
2. J.K.K. Acid Ltd., Tamil Nadu	4500		
3. Arcot Chemicals , Tamil Nadu	5000		
4. Trichy Distilleries	2500		
5. Hindustan Organic Chemicals Ltd.	3000		
6. T.N.I.D.C.	1000		
7. I.D.P.L., Bihar	4500		
	23800		34,034,00
BUTANOL			
1. Kolhapur Sugar	900		
2. Union Carbide	3000		
3. Somaiya Organics (I) Ltd., Barabanki	3000	@ 2180 Litres/ton	
	6900	15,042,000	
ETHYL ACETATE			
1. Andhra Sugar Ltd.	1270		
2. Sirsilk Ltd.	480		
3. A.P. Industrial Dev. Corporation	240		
4. Mysore Acetate & Co. Ltd.	600		
5. Indian Organic Chemicals Ltd.	1500		
6. Kolhapur Sugar Mills Ltd.	900		
7. Union Carbide India Ltd.	700		
8. Somaiya Organics (I) Ltd., Barabanki	500		
	6190	@ 845 Litres/ton 5,230,550	

1	2	3	4
New Units (Letters of Intent)			
1. Trichy Distilleries	600		
2. Arcot Chemicals, Tamil Nadu	3000		3,042,000
	3600		
ACETONE			
1. Sir Silk Ltd.	1500		
2. Cordite Factory	1500		
	3000	@ 2600 Litres/ton 7,800,000	
New Units (L.I.)			
1. U.P. State Industrial Dev. Corpn.	6000		
2. T.N.I.D.C.	900		17,940,000
	6900		
LOW DENSITY POLYETHYLENE			
1. Alkali & Chemical Corpn. of India Ltd., Rishra.	10000	@ 2730 Litres/ton 27,300,000	
STYRENE MONOMER			
1. Hindustan Polymers Ltd.	10000		
2. Polychem Ltd.	1600		
	26000	@ 910 Litres/ton 23,660,000	
PVC			
1. Chemicals & Plastics India Ltd., Tamil Nadu	14000	@ 1300 Litres/ton 18,200,000	
SYNTHETIC RUBBER			
1. Synthetic & Chemicals Ltd.	3000	@ 2430 Litres/ton 72,900 00	
ACETIC ANHYDRIDE			
1. Andhra Sugar	720		
2. Colour-Chem	800		
3. IOC Ltd., Khopoli	3600	(based on purchased	
4. Mysore Acetate	4450	acetic acid)	
5. Sir Silk Ltd.,	5200	@ 1000 litre/ton	
	14770	10,320,000	
New Units			
1. Sudarshan Chemicals, Poona (L.I.)	600		
2. T.N.I.D.C. (L.I.)	800		
3. Trichy Distilleries (L.I.)	2200		
4. HOC Ltd., Rasayani	2000		
	5600		5,600,000
ACETALDEHYDE (is an intermediate in the manufacture of Acetic Acid and as such these unit do not require any extra alcohol other than the manufacture of Acetic Acid).			
1. Atul Drug House	300		
2. Somaiya Organics	500		
	800		
Total		235,107,150	60,616,000

7—1 M of PC & F/ND/78

1	2	3	4
BUTYL ACETATE (L.I.)			
Existing Units			
1. Indian Organic Chemicals Ltd.	500		
2. Kolhapur Sugar Mills Ltd.	1000		
3. Somaiya Organics	3000		
4. Union Carbide	2700		
	7200		
New Unit			
1. Arcot Chemicals , Tamil Nadu	3000		
VINYL ACETATE			
1. Century Enka U.P. (Carbride-based)	5000		
2. Cellulose Products, Ahmedabad (Carbide-based)	2000		
	7000		
New Units			
1. M. L. Bharatiya (Alcohol-based)	5000		
2. Polyrhem Ltd. (Alcohol-based)	5000		
	10000		
2-ETHYL HEXANOL			
1. Union Carbide (I) Ltd.	2700	(existing unit)	
2. T.N.I.D.C. (L.I.)	1500		
	4200		

Capacities of Major Alcohol Based Industries

Product	Capacity/TPA	
Sir Silk Ltd. (A.P.)		
Acetic Acid	3100	
Acetone	1500	
Ethyl Acetate	500	
Acetic Anhydride	5200	
Andhra Sugar Ltd., Tanaku (A.P.)		
Acetic Acid	1080	
Ethyl Acetate	1270	
Acetic Anhydride	720	
APIDC, Hyderabad (A.P.)		
Acetic Acid	1680	
Ethyl Acetate	240	
Hindustan Polymers Ltd., Vishakhapatnam (A.P.)		
Styrene Monomer	10000	
Hindustan Insecticides Ltd. (Delhi & Alwaye)		
D.D.T.	1088	
Gujchem Distilleries India Ltd., Bilimora, Gujarat		
Acetic Acid	3000	
Auxiliary Chemicals	1300	
Union Carbide India Ltd., Bombay		
Acetic Acid	1360	
Butanol	3000	
Ethyl Acetate	700	
2-Ethyl Hexanol	2700	
Dioctyl Phthalate	1000	
Somaiya Organo-Chem Ltd., Sakarwadi, Maharashtra		
Acetic Acid	6000	
Kolhapur Sugar Mills Ltd., Kolhapur		
Acetic Acid	2500	
Butanol	900	
Ethyl Acetate	900	
Indian Organic Chemicals Ltd., Khopoli, Maharashtra		
Acetic Acid	6000	
Ethyl Acetate	1500	
Acetic Anhydride	3600	
Polychem Ltd., Bombay		
Styrene Monomer	16000	
Chem Plast		
Polyvinyl Chloride	20000	
Ethylene Dichloride	24000	Intermediates in the
Vinyl Chloride	15000	manufacture of PVC
Synthetic and Chemicals Ltd., Bareilly, U.P.		
Synthetic Rubber	30000	

Product	Capacity/TPA	
Somaiya Organic (I) Ltd., Barabanki, U.P.		
Acetic Acid	7600	
Butanol	3000	
Ethyl Acetate	500	
Alkali & Chemicals Corpn. Ltd., Rishra, West Bengal		
Polyethylene	10000	
Mysore Sugar Co. Ltd., Mandya, Karnataka		
Acetic Acid	3000	
Mysore Acetate & Chem. Ltd., Mandya, Karnataka		
Ethyl Acetate	600	
Acetic Anhydride	4450	(based on acetic acid and not on alcohol)
Sudarshan Chemicals Ltd.		
Acetic Anhydride	600	(Letter of Intent)
Colour-Chem., Thana		
Acetic Anhydride	800	(L.I.)
Atul Drug House		
Acetaldehyde	300	
Biochemical & Synthetic Products, Hyderabad.		
Ethyl Acetate	250	
U. P. State Industrial Development Corporation		
Acetone	6000	

Source : **Indian Chemical Journal — Annual 1976**

APPENDIX —16

Production of Alcohol Based Chemicals

Product	1974				1975			
	No. of units	Installed capacity (T)	Production (T)	Capacity utilisation (%)	No. of units	Installed capacity (T)	Production (T)	Capacity utilisation (%)
Acetic Acid	9	23780	20000	84.5	9	23800	14179.4	59.5
Acetic Anhydride	2	4456	4100	92.0	2	4456	3868.8	87.0
Butyl Acetate	4	7280	4000	55.0	4	7280	3924.2	53.7
Ethyl Acetate	4	3252	4000	123.0	4	3252	3075	93.0
Monochloro Acetic Acid	2	4700	3400	72.5	4	4700	2998	63.7
Pentaerythritol	2	2400	483	20.1	2	2400	85.5	3.5
DDT	2	4200	3324	79.0	2	4200	4300	100.2
Polystyrene	2	17500	9571	54.7	2	17500	9092	52.0

Capacities of Alcohol-based Chemical Industries as reported in replies to Questionnaire

Product	Capacity TPA	Production in 73-74	Capacity utilisation (%)	Production in 74-75	Capacity utilisation (%)	Production in 75-76	Capacity utilisation (%)
Sirsilk Ltd. (A.P.)							
Acetic Acid	3100	4000	129	3368	108	2570	83
Acetone	1500	16	1.0	Nil	0	30	2.0
Ethyl Acetate	500	148	31.6	140	28	127	25.4
Hindustan Polymers	10000	3368	33.68	2570	25.70	4200	42.0
Hindustan Insecticides Ltd.	4088	1945	47.6	2907	72.5	4488	109
Gujchem							
Acetic Acid	3000	Nil	—	Nil	—	4.3	—
Sodium CMC	3000	1782	58	1630	54.5	2009	69.5
Auxiliary Chem.	1300	974	75	940	72.3	972	74.6
Somaiya Organo Chemicals, Sakarwadi							
Acetic Acid	3000	2306	78.6	2888	96	2028	67.7
Acetaldehyde	3000	3060	100	3504	117	3161	105
Indian Organic Chemicals, Khopoli							
Acetic Acid	7500	7379	98.4	4736	64	6584	87.6
Ethyl Acetate	1350	1573	116	930	69	2308	170
Polychem Ltd.							
Styrene	16000	12392	77.5	7565	47.2	7849	49
Chem Plast, Tamil Nadu							
PVC	13500	NA		5854	43.4	9459	70
Ethylene Dichloride	24000			6520		16355	
Vinyl Chloride	15000			6001		9880	
Synthetic & Chemicals	30000	17383	58	21900	73	23300	77.5
Alkali & Chemicals Corporation							
Polyethylene	12500	12119	96.7	11069	88	12613	100.1
Mysore Sugar Ltd., Mandya							
Acetic Acid	3000	2346	78.4	885	29.6	2029	67.5
Somaiya Organics (I) Ltd., Barabanki							
Acetic Acid	7600	3227	42.5	4430	58.2	4384	57.7
Butanol	3000	1874	62.5	2328	74.5	1949	65.0
Other chemicals	2450	172	7.0	187	76.5	437	17.8

Acetic Acid Growth of Installed Capacity

(Qty., in tonnes)

Year	Capacity licensed	Cumulative capacity	At 10% growth	At 15% growth
1956	7440			
1958	5400	12840		
1959	3580	16420		
1960	3660	20080		
1961	1364	21444	22090	23080
1965	6000	27444	32430	40430
1972	2400	29844	63019	107030
1974	4100	33944	76252	141430
1976	3000	36940	92264	186730

1. Typical Manufacturing Cost per Tonne of Alcohol Ethylene

Plant capacity	=	3,000 tonnes/year ethylene
Fixed Capital Investment	=	Rs. 10,000,000

Manufacturing cost/tonne

Item of cost	Rs./tonne
Alcohol 2.7 kl. @ Rs. 800	2,160
Catalyst	15
Steam/Dowtherm (Oil based)	360
Power	35
Cooling Water	25
Depreciation @ 20% (corrosive)	665
Labour, maintenance, insurance etc.	410
Total ex-factory.	3,670

This is practically the same as the present ex-factory price of petro-ethylene. In this cost, alcohol accounts for 58% and hence any price of alcohol higher than Rs. 0.80/litre delivered to the point of use i.e. including transport, levies and taxes will make alcohol-ethylene non-viable.

2. Typical Manufacturing cost per Tonne of Alcohol Based Acetaldehyde

Plant Capacity	=	7,000 tonnes/year Acetaldehyde
Fixed capital	=	Rs. 18,000,000
Alcohol 1.56 kl. @ Rs. 800		1,250
Catalyst		10
Steam (Oil based)		235
Power		30
Cooling water		15
Depreciation @ 20% (corrosive)		515
Labour, maintenance, insurance etc.		430
		2,485

This will have to be compared with the ex-factory manufacturing cost of petrobased acetaldehyde. We have no data on the latter. Hence we cannot comment on the highest competitive price of alcohol for producing acetaldehyde.

Typical Manufacturing Cost of Acetic Acid

Plant Capacity	:	3000 Tonnes/Year, A. Acid
Fixed Capital Investment	:	Rs. 1.80 lakhs.
Alcohol requirement	:	1350 litres per tonne of A. Acid
Alcohol price	:	Re. 1 (One) or Rs. 1,000 per KL delivered Mfts.' factory including taxes. Capacity 3000 tonnes per annum.

		Rs. per tonne of A. Acid
Direct Cost		
1. Raw Materials	-	1350.00
2. Catalyst and other inputs	:	100.00
3. Power Fuel & Cooling	:	600.00
4. Stores & Maintenance	-	250.00
Indirect Cost		
5. Salaries & Wages		250.00
6. Rents, Taxes, Insurance & other Admn. Expenduture	:	150.00
7. Interest	:	850.00
8. Depreciation	:	850.00
Total	:	4400.00

Typical Manufacturing Cost of Butyl Acetate

Plant Capacity	:	3000 Tonnes of Butyl Acetates per year.
Fixed Cap Investment	:	Rs. 350 lakhs.
Alcohol requirement	:	2200 litres per tonne of Butyl Acetate.
Alcohol Price	:	Re. 1 per litre or Rs. 1,000 per KL delivered factory including taxes.

Direct Cost		**Rs. per tonne of Butyl Acetate**
1. Raw material		2200.00
2. Catalyst & other inputs		500.00
3. Power , Fuel & Cooling		800.00
4. Stores & Maintenance	:	400.00
Indirect Cost		
1. Salaries & Wage		350.00
2. Rents, Taxes, Insurance & other admn. expenses	:	200.00
3. Interest	:	1400.00
4. Depreciation	:	1400.00
Total	:	7250.00

Typical Manufacturing Cost of Butanol

Plant Capacity	—	3000 Tonnes/year Butanol.
Fixed Capital Investment	—	Rs. 300 lakhs.
Alcohol, Requirements	—	1900 litres per tonne of Butanol (By Dehydrogenation process).
Alcohol price	—	Re. 1 per litre or Rs. 1,000 per KL delivered factory including taxes. Capacity — 3000 tonnes.

Direct Cost		**Per tonne of Butanol**
1. Raw material	—	Rs. 1900.00
2. Catalyst & other inputs	—	Rs. 450.00
3. Power, Fuel and cooling	—	Rs. 750.00
4. Stores & Maintenance	—	Rs. 350.00
Indirect Cost		
5. Salaries & Wages	—	Rs. 300.00
6. Rents, Taxes, Insurance & other admn. expenses	—	Rs. 200.00
7. Interest	—	Rs. 1390.00
8. Depreciation	—	Rs. 1300.00
Total	—	Rs. 6550.00

8—1M of PC&F/ND/78

Statewise Average Recovery of Sugar per cent Cane (Ref. Sugar News)

	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Andhra	10.21	10.26	8.96	9.50	10.07	9.90
Assam	8.16	9.04	9.10	8.41	8.38	8.65
Bihar	9.01	8.85	9.21	8.72	8.63	9.06
Maharashtra	11.25	11.08	10.68	10.09	11.17	11.25
Gujarat	10.22	10.30	9.53	9.83	10.22	10.69
Kerala	8.68	8.85	8.25	8.48	8.59	7.14
Madhya Pradesh	9.29	9.55	9.16	9.19	8.82	9.44
Tamil Nadu	8.99	9.17	8.25	8.38	8.41	9.20
Karnataka	10.56	10.79	9.83	10.06	10.89	10.68
Orissa	8.32	9.13	8.57	8.60	8.28	8.56
Punjab	8.57	8.75	8.09	8.30	9.02	8.59
Haryana	8.69	9.33	8.80	7.89	8.97	9.28
Rajasthan	9.23	9.06	9.13	9.02	9.36	9.13
Uttar Pradesh	9.08	9.34	9.55	9.01	9.95	9.65
West Bengal	8.73	7.64	8.41	8.57	8.60	9.20
Delhi	—	—	—	—	—	—
Rest	—	—	—	—	—	—
Pondicherry	8.80	8.59	8.08	8.56	8.87	9.35
Average	9.78	10.03	9.57	9.34	9.90	10.20

Indian Standard Specification for Alcohol Denaturants (First Revision)
Formulae for Denatured Alcohol

Designation	Denaturant	Amount of Denaturant for 100 litres of Alcohol	Uses
	I. Completely Denatured Alcohol		
CD 1	Mineral synthetic pyridine bases and light caoutchoucine	0.5 litre of each	General
CD 2	Wood naphtha	5.0 litres	
	II. Specially Denatured Alcohol		
SD 1	Methyl alcohol	0.5 litre	
SD 2	Methyl Alcohol and benzene	2.0 litres of each	Manufacture of ethylene and its derivatives, acetaldehyde and its derivatives, ether, acetone etc.
SD 3	Benzene, toluene and petroleum hydrocarbon solvent	1.0 litre of anyone or combination of these	
SD 4	Ether	5.0 litres	
SD 5	Crotonaldehyde	0.2 litre	
SD 6	Acetone	0.5 litre	
SD 7	Acetaldehyde or acetaldol	0.5 lirte	
SD 8	Chloroform	1.0 litre	Manufacture of chloroform, chloral and its derivatives including DDT.
SD 9	Chloral hydrate	1.0 kg (m/v)	
SD 10	Ethyl acetate or ethyl benzoate	2.0 litres	Manufacture of ethyl acetate, ethyl benzoate and other ethyl esters.
SD 11	Methyl alcohol, benzene, acetone and ether	5.0 litre of anyone or a combination of these	(i) Solvent for lacquers, varnishes and polishes; (ii) Manufacture of thinners, cellulose and resinous materials. (iii) Purification of chemicals; and (iv) Extraction processes.
SD 12	Formaldehyde solution	10.0 litres	Manufacture of adhesives and binders, disinfectants, insecticides, embalming and preserving solutions.
SD 13	Acetone or methyl alcohol	1.0 litre	Shellac from crude lac
SD 14	Caustic Soda (or caustic potash) and caster oil	0.06 kg. 0.5 litre	Transparent soap
SD 15	Turpentine, oil of	5.0 litres	Synthetic pine oil
SD 16	Diethyl phthalate	1.0 litre	
SD 17	Brucine or brucine sulphate	0.0225 kg.	Perfumery.

No L-15021(1) 77-Ch. II
Government of India
Ministry of Chemicals and Fertilizers

New Delhi, the 17th Feb. 1977.

MEMORANDUM

Subject: Industries based upon Ethyl Alcohol — Constitution of a Committee to conduct study and make recommendations for the development of —

In the last 10-15 years, certain industries in the field of Chemicals, pharmaceuticals, pesticides, synthetic rubber and plastics based upon ethyl alcohol/rectified spirit have been set up in the country. Proposals are also received by the Central Government from time to time for setting up new undertakings for different products based upon alcohol.

Alcohol is produced in the country in distilleries set up in different areas. The alcohol so produced can be used both for potable as well as industrial purposes. The Government policy has been to encourage the use of alcohol for industrial purposes. No comprehensive study has, however, been made at Government level relating to the growth of the industries in this field and their requirements of industrial alcohol.

With a view to plan the growth and development of alcohol-based industries in a systematic manner and to ensure the optimum utilisation of industrial alcohol, the Government of India has decided to set up a Committee to make a study and prepare a report regarding the planning of the alcohol-based industries. The Committee will consist of the following:—

1. Shri A. Swaminathan, Managing Director, HOC Ltd., Bombay.	—	Chairman
2. Shri S. S. Sachdeva, Adviser, Petrochemicals, Ministry of Petroleum.	—	Member
3. Smt. Lata Singh, Director, Ministry of C & F.	—	Member
4. Shri S. P. Bhattacharya, Industrial Adviser, D.G.T.D.	—	Member
5. A representative from CSIR	—	Member
6. One representative each from the States of U.P., Maharashtra, Tamil Nadu and Gujarat.	—	Member
7. A representative of AIDA, New Delhi.	—	Member
8. A representative of All India Alcohol-based Industries Development Association.	—	Member
9. Dr. K. S. Tiwari, Monitoring and Evaluation Officer, Ministry of Chemicals & Fertilizers.	—	Member Secretary.

The Chairman of the Committee may co-opt. specialists in the field who may be available from the industry from time to time.

The terms of reference of the Committee will be as follows: —

(i) To prepare the present status of the industries based upon alcohol i.e. total approved capacities, actual installed capacities and the production achieved.

(ii) To work out estimates of the capacity likely to materialise by the end of 5th Plan i.e. 1978-79.

(iii) To asses long range demand estimates for a period of say 15 years.

(iv) To recommend specific areas of alcohol-based industries in which future growth needs to be planned.

(v) To examine the constraints on the development and growth of the alcohol-based industries and recommend suitable remedial measures.

(vi) To make any other recommendation which may help in increasing the availability and utilization of alcohol for industrial purposes.

The report of the Committee shall be made available to Government within a period of 4 months.

(C. R. CHANAN)

Under Secretary to the Government of India

To

1. Shri A. Swaminathan,
   Managing Director,
   Hindustan Organic Chemicals Ltd.,
   P.O. Rasayani, Dist. Kolaba, Maharashtra.
2. Shri S. S. Sachdeva, Adviser,
   Petro-chemicals,
   Ministry of Petroleum, New Delhi.
3. Smt. Lata Singh, Director,
   Ministry of Chemicals & Fertilizers,
   New Delhi.
4. Shri S. P. Bhattacharya,
   Industrial Adviser,
   D.G.T.D., Udyog Bhavan,
   New Delhi.
5. Secretary to the Govt. of India and Director General, Council of Scientific & Industrial Reserach, Rafi Marg, New Delhi. — With the request to nominate one representative for the above mentioned committee.
6. The Chief Secretary to the Govt. of Uttar Pradesh, Lucknow. — —do—
7. The Chief Seretary to the Govt. of Maharashtra, Bombay. — —do—
8. The Chief Secretary to the Govt. of Tamil Nadu, Madras. — —do—
9. The Chief Secretary to the Govt. of Gujarat, Gandhi Nagar. — —do—
10. The President,
    All India Distiller's Association,
    805, Kailash Apartments,
    96, Nehru Place, New Delhi-110024. — —do—
11. The President,
    All India Alcohol Based Industries Development Association,
    C/o. Somaiya Organics (I) Ltd.,
    6th Floor, Bank of Baroda Bldg.,
    New Delhi-110 001. — —do—
12. Dr. K. S. Tiwari,
    Monitoring and Evaluation Officer,
    Ministry of Chemicals & Fertilizers,
    New Delhi.

BRIEF SUMMARY OF THE HISTORY OF SUGARCANE IN BRAZIL

The sugar industry in Brazil started with the discovery of Brazil by Portuguese navigators in 1500.

The sugarcane was brought from Mahada Madeila and was planted almost simultaneously in the North (Pernambuco) and in the South of Brazil (Sao Paulo). The first sugar mill was built in Sao Vicente, in the State of Sao Paulo in 1532.

Later on, sugar mills were built in several seaside areas, being gradually concentrated in areas where the soil and climate conditions were the most appropriate.

The sugar period was of the greatest social, economical and political importance and lasted 150 years being interrupted by the discovery of gold and diamond in Mines Gerais.

All over the seventeenth century and during most of 18th century, Brazil was the most important sugar supplier in the world. This important position called the attention of the largest countries and of the European trade companies. In the old continent, the Brazilian area of Pernambuco was known as 'Zuickerland'. These facts explain the invasion and domination of Brazil for 25 years by the Dutch belonging to the Western India Company, which held at that time, the majority of the world sugar market.

In 1643, when the first phase of the Portuguese colonization was over, the culture refinement and trade of sugar reached its higher level. During this period, the sugar mills of the colony produced a total of 75,000 tons per year.

The importance of this industry decreased during the last quarter of the 17th century when Spaniards and Dutch started to expand their sugar plantations, building sugar mills in their Caribean colonies.

With the decline of gold mining in the beginning of the 19th century, the sugar industry became active again.

During the 19th century — Sugar mills were modernised with the installation of steam engines and introduction of modern methods. The increasing interest was stimulated by the European market requirements, weakened with the destruction of its sugar best industry.

In the last decades, the Brazilian Sugar Industry had a new period of modernisation with new equipment expansion of the existing mills and building of new ones.

During the economic crisis in 1929-30 the sugar production exceeded the internal and external requirements resulting in a sudden decrease of price. The Government had to interfere in the sugar industry creating production shares in order to balance production and consumption.

In 1933, the Alcohol & Sugar Institute (Instituto de Acucar e do Alcohol) was founded in order to control the production, marketing and distribution of the sugar and alcohol industry in Brazil.

The Second World War resulted in deep changes in the Sugar Industry in Brazil with a great expansion of its production capacity, thus enabling Brazil to compete in the international market.

In 1973 Brazil held the position of the first biggest sugarcane planter, the first exporter and the second biggest producer in the world.

Compiled by

A. B. Roychowdhury of AABIDA.

SALIENT FEATURES OF SUGAR/ALCOHOL INDUSTRIES IN BRAZIL & ITS ECONOMY

BRAZIL

Consists of 22 States

Population	—	110,000,000
Area	—	84,000 sq. kilometre
Economy	—	Export of cotton & soyabean (second largest in the world) Export of coffees (first largest in the world) Sugar (one of the largest producers and exporters)

60/80% of the country's annual requirement of iron of standard quality is obtained from indigenous ores but specialised steel requirements are imported from Germany and USA.

Chemical Industries of almost all sorts are established in the country.

60% of petrol/gasolene requirement is imported and balance 35/40% met by alcohol.

People are very gay and hospitable.

Language spoken largely Spanish, partly Portuguese and hardly English and French.

Unemployment hardly any about 2/3%.

Currency—Cruzeiros CR $ CR $ 14.89 = US 1 $.

SUGAR

Current sugar production 8,000,000 tonnes per annum.

Next year's target 9,000,000 tonnes.

208 sugar factories are in existence. Number of sugar factories may be reduced for the plans in hand for amalgamation of units for large scale operations.

Sugar season lasts for 150 days/year. Sugar yield about 9.5 to 9.8% of the cane crushed.

2 Sugar seasons — 1 May to November, sometimes extends to December for North-East Mills and 2 — December to May for South-East Mills.

Price of Cane — CR $ 160 per tonne.

Price of Sugar — CR $ 3, 30 per kg in bags of 60 kg. ex-works.

Price of molasses CR $ 800 per tonne (price of molasses is however misnomer as nothing is sold, almost everything is consumed by the distillery in the factory). For calculation's sake CR $ 800 per tonne is estimated.

A small portion of molasses is used for cattle feed and foundry works.

SUGARCANE

90,000,000 tonnes of cane now used for sugar manufacture.

10,000,000 tonnes of cane used for manufacture alcohol direct from sugarcane.

1,660,000 hectares for cane factory. Yield of cane per hectare is about 90 tonnes.

ALCOHOL

930,000,000 litres of alcohol are produced from molasses.

Average yield per tonne of molasses is 290 to 300 litres with 55% total reducing sugar.

Currently 160 distilleries are in operation and the number of distilleries may increase to 250 before long.

Distilleries are not totally dependent on molasses from sugar factories as in India and other countries -- here distilleries also work without molasses but sugarcane directly, and therefore, the number of distilleries could be more than the number of sugar factories.

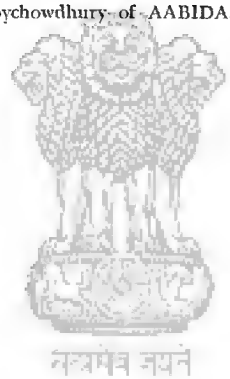
Yield of alcohol of 95/96% strength per tonne of cane varies from 67 to 71 litres.

Now total production of alcohol in Brazil 1,550,000,000 litres and they expect to reach the production of 4,800,000,000 litres by 1982/83. After production of about 800/900 million litres from molasses, rest will be produced from sugarcane direct.

Currently out of total alcohol production of 1,550,000,000 litres, 400,000,000 litres are consumed for industrial usage and the balance 1,150,000,000 litres used as fuel.

Potable requirement separately obtained from hydrated alcohol in the process of manufacture of alcohol both from molasses and sugarcane direct.

Compiled by: A. B. Roychowdhury of AABIDA.



MANUFACTURING OF DIRECT AND RESIDUAL ALCOHOL FROM SUGARCANE PRACTISED IN BRAZIL

The sugarcane juice destined for the manufacturing of alcohol is separated in the grinder and submitted to a special treatment.

This juice may be a part of the mixed juice for the sugar manufacturing or a weaker juice separated in the extraction of one or more final results in the grinder.

After screening by the grinder cush-cush, the juice is taken to the juice weighers, to he weighed. From the weighers, it goes to the phosphotation tanks, where it obtains liquid phosphoric acid or some phosphorous chemical product.

There, it goes to a DSM special screen with a 0.5 mm spacing, where the substances in suspension are withdrawn.

The screened juice is heated at 95°C, pasteurised and remitted to the floccule decanter where the colloids and the substances not retained by the screen are separated.

Then there are two alternatives.

In the first one, the juice is cooled in heat interchange equipment and remitted directly to the dosing tank for immediate fermentation.

In the second one, where one wishes to store raw material for distillery, the juice is evaporated at 60° Brix, cooled and stocked.

MUST PREPARATION PROCESS

The must for fermentation purposes is formed of the pasteurised sugarcane juice, residual molasses or syrup.

The dilution is performed in a continuous system with a proportional dosing of the several types raw material.

The must concentration shall be kept always constant.

This must is conveyed to the pre-fermenters, where leaven (yeast) wash will be added or it will go straight to the fermentation tubs.

The pre-fermenters are equipped with special mixers with bronze propellers, enabling the formation of a perfect mixture of leaven with must, constituting the tub base, which is sent to the fermentation tub.

The fermentation tubs are cylindric tanks of great capacity where the must is introduced for fermentation purposes.

After receiving the tub base, the tubs are filled with the must deriving from the dilutors, where the fermentation process starts lasting from 10 to 12 hours. The tubs are equipped with a water internal cooling system in order to avoid that the fermentation heat increases the must temperature to more than 30°C.

Having the fermentation finished, the resulting wine is sent to the decanters and then to the leaven separator centrifuges. The Melle-Boinot process for leaven recovery consists in a separation, by centrifuge process, of the leaven cells of the wine fermented in the tubs before being saturated of leaven, prevents its proliferation reducing the sugar consumption and thus increasing the efficiency of the operation after recovery, the leaven wash shall be again mixed with must and sent to the same tub from where it was withdrawn (which was already cleaned and sterilized with exhaust steam) and the described process will be repeated again.

The necessary sulphuric acid is received in tank truck and deposited in cylindric horizontal iron tanks, from where it is transferred by a compressed air process to the pre-fermentation tubs through polyethylene piping.

9—1 M of PC & F/ND/78

The anhydrous alcohol production is effected by the Mellc technique (distillation and rectification, combined with dehydration by the Benzine-Benzol azeotropic — equal parts — mixture).

The equipment is composed by 5 columns, as follows: —

AA¹ — Distillation column
B¹ — Rectification column
B — Exhaust column
C — Dehydration column
D — Aldehyde column

Column C is operated or not, depending if anhydrous alcohol or rectified alcohol is desired. Therefore, for the production of rectified alcohol, only four of the five columns shall be operated, the dehydration column will not be used. The equipment will then operate as a common rectifier, from the wine deriving from the tubs producing a rectified alcohol at 96°C G.L. If anhydrous or absolute alcohol is desired, the five columns must be operated. The dehydrating agent is the Benzine-Benzol, a mixture in equal parts of Benzol and Heptane.

For anhydrous alcohol production, the sequence of operations should be as follows:

The centrifuged wine which was pumped (by means of two pumps of 25,000 litres each) to a tank located on the upper part of the distillation column is submitted to a pre-heating in the heater condenser and is taken to a temperature of about 90°C in the heat recover of the K por wine. At this temperature, it is remitted to the AA¹, distillation column where it will descend the trays, being exhausted of alcohol. This alcohol after being submitted to the separation of the gas products (6 to 7%) shall follow to the B rectification or concentration column, from where the fusible oil to be taken to an oil decanter washer is exhausted.

Placed before B column, B¹ column serves as an exhaust column and also feeds column B with alcohol steam and exhaust water by its lower part by means of a syphon.

In B column, which already contains a part of the dehydrant agent, the alcohol will be submitted to a rectification and partial dehydration. On the upper part of the column, azeotropic mixture steams will be formed from which water can be eliminated by condensation and decantation processes.

In an intermediary part of column B, alcohol at 98.5° G.L. shall be extracted. This alcohol containing benzol will be sent to C dehydration column, where it will be completely deprived of water and benzol and after being cooled and measured, will be remitted to the absolute alcohol depot or tank.

The benzol eliminated on the upper part of C column shall go back to the main column of dehydration, once recovered.

The impure alcohol liquids extracted from columns C, AA¹ and from the N decanter will be sent to D column where aldehydes will be extracted. The resulting alcoholic waters will be drained from base of the D column and sent to the 'B' column.

The above described equipment produces high quality rectified alcohol since a refinement column has been inserted between the C & D columns.

PRODUCT STORAGE

The produced alcohol, in its several qualities, shall be deposited in separate intermediary tanks and then pumped to the deposit tanks. The distillery deposits are comprised:

For molasses and syrup — 3 tanks with a capacity of 3000 m³.

Compiled by : A. B. Roychowdhury of AABIDA.

Memorandum submitted by All India Alcohol Based Industries Development Association to the Committee on 10th October, 1977

Summary of Points made in the Memorandum submitted by AABIDA

Bombay, October 10, 1977.

Shri A. Swaminathan,
Chairman, Committee appointed
by Govt. of India "for development
of Industries based on Ethyl Alcohol",
Office of Hindustan Organic Chemicals Ltd.,
Harchandrai Mansion,
M. Karve Road, Bombay-400 002.

Sir,

We welcome the appointment of the Committee under your able stewardship to study and report on the augmentation of production of Alcohol in India and steps needed to expand its usuage for Industrial purposes.

2. EARLY PROGRESS:

It will not be out of place to recall briefly the progress made during the last two decades. The Alcohol-based Industries made an auspicious start in India in 1950s on the basis of the recommendations made by the Dr. Nagaraja Rao Committee in 1956. The production of many chemicals and organic products, such as polyethylene, Acetic Acid, N. Butanol, Styrene Monomer, P.V.C. and other items were established in quick succession culminating in the large capacity synthetic rubber plant in U.P. where the largest quantity of alcohol was available for industrial purpose. The synthetic rubber plant in U.P. integrated facilities for the production of Acetaldehyde, Butadiene and Styrene Monomer. The progress in these projects was so good that the Govt. of India programme for the use of alcohol as a motor fuel for admixture with petrol under the Indian Power Alcohol Act was abandoned and all available of subsidiary programmes such as that for esters, cellulose acetate, DDT etc. also emerged following the basis production of organic chemicals from alcohol.

3. PARTIAL SETBACK:

The Alcohol-based Industries in India, however, suffered a partial eclipse in the 1960s, because of the emphasis which was placed on petrochemical developments. It was the Govt.'s intention to make a beginning in the organic chemical industries using non-petrochemical raw materials like alcohol to the extent possible. However, the requirements of many plastics and polymers were growing fast and as in other countries resulted in the need to use petrochemical raw materials to meet the surging demands. Various programmes were recommended by the Dr. Kane Committee on petrochemicals and also by an expert from France, Dr. Henny. As a consequence a medium sized Naphtha cracker was established by M/s. NOCIL and a smaller Naphtha cracker was also established by M/s. Union Carbide in Bombay. M/s. Union Carbide switched over from alcohol to petrochemical ethylene for making polyethylene, while NOCIL established a wide variety of down-stream products using ethylene and propylene from the Naphtha cracker. Plans for a large petrochemical complex in Gujarat also took shape but this programme is proceeding slow and is expected to be in operation only in '78. These developments served as a damper on further development of alcohol-based chemicals.

4. SUGAR PRODUCTION:

Meanwhile, the sugar industry in India was also in poor shape with the resultant wide fluctuations in the production of sugar and molasses. It was becoming difficult to meet the alcohol requirements of industries already established in the country and the problem was further acentuated by the ever-rising demand of alcohol for potable purposes. The operation of alcohol-based industries suffered somewhat during this period apart from the fact that no further development or investment could take place.

5. OIL PRICE INCREASE:

The situation took a very different turn towards the end of 1973 when the oil prices were hiked up very steeply and the economics of petrochemical operations were not that attractive. The realisation that petroleum was also a depleting resource introduced a totally new dimension to the situation and the use of agro derived raw materials for chemical industries have now assumed great importance. It is in this context that there is need to plan further developments of alcohol-based industries.

6. THE AABIDA:

It was, in these circumstances, that the All India Alcohol-based Industries Development Assn. was formed and was inaugurated on 18th December, 1976. The Association includes all the major alcohol-based chemical producers and its principal objective is the promotion of the growth and development of diverse industries based on alcohol as the main raw material and to maintain the viability of alcohol as an economic feedstock for industries. The Association will also strive its best for augmenting production and efficiency, reduction in the cost of products, for research and development and will conduct such other activties as would be conducive in achieving the above stated main objectives.

7. ADVANTAGES OF USING ALCOHOL:

Your Committee is no doubt aware of the specific advantages of using alcohol as raw material for industries, (i) Alcohol is by-product of the sugar industry which is linked to agriculture; thus as a feedstock, it is ever replenishable, (ii) The technology for chemicals from alcohol is capable of adoption on a comparatively smaller scale for many products to meet limited local markets, (iii) There are no handicaps by way of unwanted by-products which are usually associated with petrochemical operations, (iv) There is only limited need for import of technology which is readily available where required, from foreign countries on reasonable terms, (v) India is also rich in other fermentable materials besides molasses; so that if and when the need raises — which will be remote — the production of alcohol could be organised on other raw materials in addition to molasses.

8. THE SUGAR SITUATION:

It may also be pointed out that the sugar industry in India recently received a new impetus due to higher price of sugar in the international market and opportunities for export of sugar. With a target of production of 7 (Seven) million tonnes of sugar by 1983-84, it is anticipated that this is likely to result in over a million tonnes of additional molasses, equivalent to about 250 million litres more of alcohol. It is, therefore, proper that new alcohol, based industrial programmes are planned and implemented as well as the existing capacities be suitably expanded to use the additional alcohol supplies. It may also be pointed out that the Govt. of India has now announced a policy for country-wide prohibition and the implementation of such a policy will release another over 100 million litres of alcohol obviously for industrial use.

9. PRESENT STATUS ON ALCOHOL-BASED INDUSTRIES:

We are giving herewith Statement (I) on the present allocation of alcohol to different states for different industries for industrial purposes. The estimates of the requirement of alcohol in the country State-wise, Industry-wise are also indicated in Statements II & III. There is a wide gulf between supplies available and the requirement in some States due to the large increase in the demand of alcohol for potable purpose. Once the question of priority for alcohol for industrial use is accepted as the basic policy, many of the problems of inter-state allocations could be resolved.

10. CONTINUING PROBLEMS:

While we have indicated the present status on alcohol used capacities for industrial production, it would not be out of place to mention some of the administrative problems which continue to plague this sector in spite of the operations during the last 2 decades.

11. LEVIES ON ALCOHOL:

There is no uniformity in the levies on Alcohol used for industrial purpose in different States. *Ad hoc* charge in various forms are levied on alcohol used for basis industrial chemicals in spite of the clear recommendations of the Dr. Nagaraja Rao Committee that such usage be free of all taxes exceeded Rs. 50 crores.

Recently a Committee under Dr. Bimal Jalan has looked into the matter and made recommendations for uniformity in these levies which should be only nominal on alcohol used for industrial purposes. This recommendation has been accepted by Govt. of India and State Government and we hope they will be faithfully implemented so as to remove all vagaries and uncertainities.

12. DISTRIBUTION AND ALLOCATION:

Besides Taxation, there are many administrative hurdles in the allocation of mollasses to the distilleries and of alcohol to the industrial consumers. It should not be difficult to allocate the respective raw material requirements with specific sources to the consumers annually in advance so that the regular production can be properly ensured. It should also be ensured that industrial units are allowed to utilise their own production of molasses or alcohol as the case may be without having to go through an allocation procedure.

13. EXPORTS OF MOLASSES AND ALCOHOL ALSO ADEQUATE STORAGE:

We have referred to the problems of interstate supply of alcohol. The exports of both alcohol and molasses have been made from time to time and created distortions in the production and supply picture in India. We do hope that export of molasses and/or alcohol will be totally avoided and efforts would be made to build up buffer stocks against any possible fluctuations in supplies from time to time. It is always more desirable to export value added end-products than to export industrial raw materials like molasses and alcohol. We are sure that your Committee will recognise the vital importance of alcohol as a raw material for chemical industries and recommend steps for the complete industrial usage within the country. For building up buffer stocks as well as for holding regular seasonal stocks, adequate storage facilities be created both at the producers' as well as consumers' end to ensure continuity of supplies and maintenance of quality.

14. PRICE FOR ALCOHOL:

Alcohol is subject to a price control order. While supplies are being made to major consumers in accordance with this order, there have been many complaints that prices charged are often above the ceiling fixed in the price control order. We understand that alcohol producers have requested for an upward revision in the price, consistant with the factors other than the increase in price of molasses which, it is claimed, have not been taken into account so far. It is also understood that the Bureau of Cost and Prices is already looking into this matter and a decision is expected shortly. AABIDA would like to point out in this connection that the supply of alcohol has to be at a price level which is conducive for the chemical operations and also conducive to the maintenance of reasonable price levels of products derived from alcohol. This is a serious matter on which adequate attention is required to be paid so that not only the industries already established in the country can continue in production and have normal expansion but also that fresh investment could be made in the desirable areas of alcohol based chemicals. AABIDA would like to suggest that the ultimate delivered price of alcohol for major industrial products should not exceed of Rs. 1/- per kg. (i.e. 80 ps per litre) including transport and levies if any. If at all the price has to increase due to inflation and other factors, the increase should be gradual and nominal so as not to upset the operations in the downstream sector. We are fully aware that the producers of molasses, alcohol and alcohol-based chemicals have to co-exist in a healthy atmosphere of development and we fully believe that your Committee will recommend appropriate steps for such a healthy and co-ordinated growth.

STATEMENT I

PRESENT STATUS

Name of the State	Name of the Industry	Recommended allocation of alcohol during 1975-76 (in M. Litres)
1. Andhra Pradesh	Acetic Acid Polystyrene & others	32.0
2. Delhi	D.D.T. Factory	1.8
	Pharmaceuticals & other Miscellaneous	12.00
3. Gujarat	Industries	1.00
4. Haryana	Gurewell Factory	8.00
5. Karnataka	Cellulose Acetate & Others	1.8
6. Kerala	D.D.T. Factory	75.00
7. Maharashtra	Union Carbide, Acetic Acid and Others	21.00
8. Tamil Nadu	Chemplast and other (PVC)	68.00
9. Uttar Pradesh	Syn. & Chemical & Somaiya Organics	45.00
10. West Bengal	ACCI & Others	
	Total :—	265.6
	Say	266

(Source : Based on Alcohol Committee 1977)
(Annexure II of Background Paper)

STATEMENT II

AABIDA Estimates of Statewise Requirement of Alcohol for Industrial Uses by 1980-81

	(In Million litres)		
	Requirement of existing units	Requirement of new units already licensed	Total
1. Andhra	27.00	..	27.00
2. Delhi	2.00	..	2.00
3. Gujarat	19.00	..	19.00
4. Haryana	0.20	..	0.20
5. Karnataka	8.00	..	8.00
6. Kerala	1.60	..	1.60
7. Maharashtra	90.00	10.00	100.00
8. Tamil Nadu	25.00	35.00	60.00
9. U.P.	121.00	16.00	137.00
10. West Bengal	46.20	..	46.20
11. Orissa	..	6.00	6.00
12. Bihar	..	7.00	7.00
	340.00	74.00	414.00
Add :		..	40.00
(i) French Polish	..	..	40.00
Varnishes etc.	..	..	90.00
(ii) Hospitals	..	..	
(iii) Misc.	..	.. Total	584.00
	Non-Industrial Potable use		60.00
			644.00

STATEMENT III

Comparative Statement of Estimated Requirements of Alcohol by 1981 (Industrywise)

	DGTD Estimates for 1975/76	(In million litres) Fermentation Panel Estimates 1981	AABIDA Estimates (1980-81)
1. Synthetic Rubber	53.00	77.00	96.00
2. Plastic Group			
P.V.C.	16.00	40.00	25.00
L.D.P.	35.00	80.00	45.00
3. Organic Chemicals :—			
(i) Acetic Acid (including Acetate Rayon Yarn)	61.00		
(ii) Butanol	15.00		
(iii) Butyl Acetate	18.00		
(iv) Cellulose Acetate	8.00		
(v) Styrene	13.00		
	115.00	75.00	
4. Pesticides or D.D.T.	3.60	6.00	Items (3-4-5)
5. Pharmaceuticals	30.00	16.00	174.00
	252.60	294.00	340.00
6. French Polish & Varnishes etc.	10.00	40.00	40.00
7. Hospitals	—	40.00	40.00
8. Miscellaneous	10.00	90.00	90.80
	272.60	464.00	510.00
Provision for new licences already issued for industrial use	—	—	74.00
	272.60	465.00	584.00
Non-industrial Potable use	—	180.00	60.00
Total	—	644.00	644.00

15. DEVELOPMENTS ACHIEVED WITHOUT GOVERNMENT SUBSIDY:

It would not be out of place to mention in this connection that development of alcohol-based industries in India has been without any kind of subsidy from Government of India. Many other countries have subsidised the prices of alcohol for specific industrial uses through a Government monopoly agency purchasing alcohol from different sources at subsidised prices, and regulating supplies for different end-users at different prices, depending upon the ability to pay. We do not think that such a system would be necessary here. The evolution and continuation of healthy Government policies on pricing, and distribution of molasses and Alcohol and implementation of uniformity of levies would be adequate for India.

16. ALCOHOL AVAILABILITY AND PROGRAMMES:

We have estimated that the production of alcohol in relation to a sugar production of 7 million tonnes in 1983-84 will be about 600 million litres. Improvements in the operation of distilleries producing alcohol and in the quality of molasses and its storage would go a long way in augmentation of availability of alcohol. The above quantity of alcohol may be compared to the present production of about 430 million litres. Out of the current production, it is understood that about 250 to 270 million litres are used for industrial derivatives such as polyethylene, synthetic rubber, acetic acid, butyl alcohol, actanol, P. V C. and polystyrene. It is estimated that about 150 to 180 million litres are used for potable and other industrial usages such as for pharmaceutical etc. Our objective should therefore, be to establish additional programme for industrial use of about 200 million litres of alcohol in the course of next five years. Considering the targets for various organic chemicals, plastics, etc. which had been formulated some time back and taking into account the products for which alcohol would be most appropriate technologically, we are attaching a Statement (Statement IV) on products quantities and alcohol required by 1983-84 for your Committee's considerations and recommendations. This indicates a programme for industrial uses for 450 million litres excluding requirements for French Polish, Varnish, Hospitals for pharmaceuticals and other miscellaneous uses.

17. IMPACT OF POTABLE USAGE OF ALCOHOL:

It is essential to note that the establishment of such industries and investments there on should not suffer through fluctuations in the price of alcohol or disruptions created by according over-riding priorities to alcohol for potable purposes. We hope all uncertainties of this type will be eliminated. It appears to be odd for Government.

STATEMENT — IV

	Present production from Alcohol	Addl. production by 1983-84 from Alcohol	Alcohol reqd.¶ (million) Litres	Remarks
	1	2	3	4
Polyethylene	13,000	—	35	It is doubtful if present operation can continue. If alcohol is not kept free of levies and if it is not kept at reasonable price this is the only alcohol-based LDP unit in the world.
Ethylene oxide and glycol	—	15,000	40	
PVC	10,000	30,000	36	Location will depend on cheap chlorine.
Styrene	16,000	4,000	20	Full capacity utilisation of existing Plants.

10—1 M of PC& F/ND/78

1	2		3	4
Acetic Acid	30,000	40,000	91	Includes Vinyl acetate.
Butadiene	22,500	7,500	72	For synthetic rubber (-same remarks as for Polyethylene).
n-Butanol	6,000	4,000	21	Marginal expansion and as component of 2/ethylhexanol production.
2-ethyl hexanol	3,000	15,000	50	
Other acetaldehyde derivatives-				
crotonaldehyde, glyoxal	1,000	—	15	
Pyridines, polyols, etc. Acetone	1,500	3,000	35	
Other misc. products like ether, ethyl acetate, diethyl, maleate, DEP etc.	—	—	50	
			450	

India, with a declared policy for prohibition, going to the rescue of State Government who are frantically looking for supplies of alcohol for potable purposes. In our view, the best approach to resolve such a situation would be for such States to produce alcohol locally from materials other than molasses such as Mahua etc. to the extent that is necessary. Such alcohol is no douht, more costly but even the higher cost of production from such raw materials are far below the ultimate price charged to the consumer of potable alcohol. Such arrangements would reduce the pressure on Government of India to divert for potable purposes the alcohol earmarked for industrial uses.

18. USE OF RAW MATERIALS OTHER THAN SUGAR-FACTORY MOLASSES:

Your Committee has raised the question of using other raw materials to produce alcohol for industrial use. AABIDA is of the view that under the present situation, producers of the major alcohol-based chemicals cannot afford the price of alcohol when produced from raw materials such as starch or cellulose or forest wastes. It is estimated that the price of alcohol produced from raw material such as tapioca or potatoes or directly from sugar cane juice may be of the order of Rs. 3.50 per litre roughly 4 times the present price of alcohol from molasses. Such higher price of alcohol may be acceptable for certain exclusive industrial users such as pharmaceuticals and organic intermediates where the price of alcohol is very insignificant in the ultimate cost of the products. Where the alcohol is the principal item of cost, a price of Rs. 3.50 per litre would be unworkable unless there is a Government subsidy. Our view is that the use of cane sugar molasses would provide enough alcohol for industries and supplementary production from Khandsari molasses could meet other requirements.

19. LONG TERM POSITION:

We have not studied the question of long term use of alcohol over a period of 15 to 25 years and the need, if any to use other raw materials. Although it is reported that cellulose materials have been successfully converted into alcohol, we do not think that the developments have reached a stage for successful commercial adoption. Such research and development programme should be continued so that waste cellulosic materials can be used properly as a source of sugar and protein even if not of alcohol.

20. ALCOHOL vis-a-vis PETRO-CHEMICALS ETHYLENE:

The problem of alcohol as a feed stock vis-a-vis petro-chemicals requires to be analysed in depth, both technologically and economically. The methods for use of alcohol as feed stock generally involve one or two basic processes i.e.

(a) dehydration to ethylene

(b) Oxidation or dehydrogenation to acetaldehyde.

A sizeable production in this manner is already established in the country viz : Polyethylene, by ACCI Rishra, P. V. C. by Chemicals & Plastics Ltd., Mettur, Styrene by Hindustan Polymers, Vizag. Synthetic and Chemicals Ltd., also make styrene in this way. Polychem use this process whenever petro-ethylene is not available. It would no doubt be necessary to continue the production in these units in the foreseeable future for many years to come as there are no alternative raw materials for them.

In fact production of ethylene from alcohol could be competitive depending on local circumstances. For example in making PVC via ethylene, chlorine will have a more crucial influence on costs and alcohol could be used in special cases. Similarly the price of benzene may have more importance in the cost of production of styrene than the price of alcohol or of ethylene. We have kept these in view in formulating our suggestions for additional production programmes to utilise in all 450 million litres per year in the Statement IV.

21. ACETALDEHYDE DERIVATIVES — ALCOHOL IS BETTER:

On the other hand, the second method of conversion to acetaldehyde is basically and fundamentally an economic operation when using Alcohol. Acetaldehyde leads to a wide range of down-stream products such as Acetic Acid, Acetic Anhydride, N. Butanol, Octanol etc. and the production of these linked to alcohol is therefore a reasonably economic approach and should continue to be encouraged actively.

In a recent article in Hydrocarbon Processing of U.S.A. the effect of feedstock costs on acetaldehyde production are assessed as under:

Feedstock Cost		$/MT	Cost of production of acetaldehyde $/MT
Alcohol	(U.S.A.)	395	675
Alcohol	(Brazil)	143	366
Ethylene	(Brazil)	408	397

As against delivered cost of alcohol at Re. 1 to Rs. 1.50 per kg. in India the use of Ethylene from a naphtha cracker at Rs. 3.50 per kg. is far less attractive for making acetaldehyde.

In fact AABIDA would like to suggest that the production of acetaldehyde and its derivatives should be more or less exclusively reserved for production from alcohol and capacity from petro-chemical ehtylene should not be encouraged.

22. OTHER COUNTRIES : BRAZIL'S POLICY:

We would like to mention in this connection that other countries have adopted more positive measures to develop and strengthen alcohol based chemical production. In the case of Brazil the price of alcohol is determined in relation to the price of ethylene derived as a petro-chemical. The proposal there is that the alcohol price be 35% of that of the ethylene price. The difference if any between the price fixed and the cost of production of the alcohol would be made up by Government subsidy. It is understood that the current petro-chemical ethylene price in Brazil is $ 408 per tonne. On this

basis the price of alcohol works out to $ 143 per tonne (which is a subsidised price). It is further estimated that in the manufacture of acetaldehyde an even higher price of alcohol at $ 209 per tonne is workable as against the ethylene price of $ 408 per tonne. Brazil has launched an ambitious programme of using 4 million kilo litres of alcohol a year. Some of this production comes directly from sugar-cane. By 1980 it is planned that out of these 4 million kilo litres, 3 million kilo litres would be used as a fuel by blending with petrol and one million kilo litres will be used as feed stock for chemicals. Brazil's policy has been dictated because of her need to import 80% of her current demand of 50 million tonnes of petroleum; such imports constitute 30% of the value of total imports into the country. It should also be noted that Brazil has already 2 operating petro-chemical complexes with capacities of the order of 300,000 tonnes of ethylene each and has also taken up a 3rd such programme. Brazil's policy has been to support or subsidise the price of alcohol in relation to that of ethylene, so that the entrepreneurs choose whatever source or feed stock they find more attractive.

23. APPROPRIATE COMPLIMENTARY PROGRAMME FROM ALCOHOL AND PETROLEUM:

Alcohol will have to play a major role in the field of some organic chemicals, plastics and polymers while other production programmes have to be based on naphtha or natural gas. There are several areas where only petro-chemical raw materials can be used for example — most of the derivatives from propylene and also of the aromatics—benzene, toluene, xylene etc.

24. We have indicated the areas in which alcohol could play its useful role as a major feed stock, with the added advantage of its being derived from renewable agricultural produce. We would like to suggest in this regard that the Committee might suggest a judicious reservation of items of Organic Chemicals which may profitably and in the national interest be exclusively earmarked for being made out of Alcohol. We submit herebelow an indicative list which may be reserved for being based on Alcohol alone:—

Acetaldehyde

Acetic Acid

Acetic Anhydride

Ethylene (when petro ethylene not available)

N. Butanol

2-Ethyl Hexanol

Vinyl Acetate Monomer

All Acetates & Esters such as Ethyl Acetate

Butyl Acetate, Aceto Acetic Ester

Glyoxal

Pyridine

Other Derivative Products such as MCA, CMC and solvents such as D.E.P., D.B.P., D.O.P.

25. BOMBAY HIGH:

At this stage it would perhaps be appropriate to refer to "BOMBAY HIGH and the tremendous possibilities that have been thrown up on account of Natural Gas and the Associated Gas, which would now be available in plenty.

26. It would be foolish if the hydro carbon resources of the country are not utilised intelligently, usefully and gainfully. Petro-chemical feedstocks can be used in diverse ways. For a developing Country like India, one's attention

naturally turns towards satisfying the prime needs like food, shelter and clothing before one thinks of other avenues of utilisation. Fertilizers, synthetic fibres and plastics and polymers therefore assume priority as they go a long way in meeting the desired objectives.

27. Rumblings are however being heard of a huge complex being thought of around Bombay for making Acetaldehyde out of the associated gas of the Bombay High with an idea to manufacture various organic chemicals based on Acetaldehyde. We submit that a most careful consideration and thought be given to this matter before such a proposal is approved. Apart from the economics of such a giant plant — which are not known —, one may point out that such a huge Acetaldehyde complex could displace a number of medium sized alcohol-based organic chemical plant dispersed all over the country located both near the source of availability of alcohol and serving the consuming industries round about. But more than this, one must not overlook the CARCINOGENIC properties of petro-gas and its by-products. Acetic acid, Acetic Anhydride, Butanol etc. are used in a number of life-saving drugs and pharmaceutical preparations. Molasses or agro-based alcohol is free from such carcinogenic danger. Even its spent-wash is also not carcinogenic.

28. Great thought therefore requires to be given before thinking of any Acetaldehyde project based on associated gas from Bombay High.

29. **BASIC PROBLEM:**

Even at the cost of repetition, AABIDA would like to place before your Committee that the basic problem of the alcohol based industries is

(a) Adequate availability of alcohol;

(b) timely availability of alcohol; and

(c) availability without the burden of taxes and at a fair price.

30. If one surveys the national scene in the country in the sphere alcohol based industries, one would immediately observe that—alcohol based industries have done reasonably well, whenever the State Governments have followed a progressive policy making adequate alcohol available to the alcohol-based industries in time and without any burden of levies. However in States, where adequate alcohol has not been allocated whenever required or allocations have been slow and halting, or very heavy State duties and levies have been imposed, the industries have languished.

31. **INDUSTRIES LEFT IN THE LURCH:**

When the chemical industries are set up, they are assured that the molasses or alcohol would be made available. After setting up the plants, the picture changes. The State authorities in charge sometimes divert alcohol for potable consumption obviously on account of revenue considerations. This is often done in disregard to the requirement of the chemical industries. These incidents have happened and are happening in different States in varying degrees.

32. **HUGE PROFITS — MYTH:**

There appears to be a misplaced notion that alcohol-based industries are making huge profits and therefore can bear increased alcohol prices or levies. This is far from true.

33. It would appear that this erroneous impression has lingered because of good results of the old established units like "Union Carbide" or "ALKALI-ICI". It is often forgotten that these two units have a variety of products apart from those made out of alcohol and that these units were set up several years ago.

34. MAJOR UNITS—ALL STRUGGLING:

Let us take the comparatively recently established large-scale alcohol-based units:

(1) Synthetic & Chemicals — Bareilly (U.P.)

(2) Sirsilk Limited, Kagaznagar (A.P.)

(3) Somaiya Organics — Barabanki (U.P.)

(4) Hindustan Polymers — Vizag (A.P.)

(5) Mysore Sugar (Alcohol Plant) — Mandya (Karnataka)

(6) Acetic Acid Plant of A.P.I.D.C., Hyderabad (A.P.)

35. Each one of the above units has been struggling for a long time to find their feet. Now, this is surely not on account of lack of required managerial skill or professional expertise. Whatever other reasons, in each case, adequate or timely availability of the raw material and or at a fair price has been the common problem. Surely in such an eventuality if the raw material is burdened with high prices or levies or taxes, it would worsen the condition of the units, not improve the same.

36. (G) ESSENTIAL TO REDUCE MOLASSES PRICE:

Permit us to point out once again that the main trouble is really not the Alcohol price but Molasses price. In the end of 1975, Govt. of India, for some inexplicable reason, suddenly increased the price of Molasses from Rs. 10/- per tonne to an unexpectedly high figure of Rs. 60/- per tonne — a five hundred per cent rise. Even the sugar industry which got the rise was surprised. In fact, the sugar industry had asked for a rise from Rs. 40/- per tonne to Rs. 20/- or Rs. 25/- per tonne.

37. This rise to Rs. 60/- does not do any good to anyone; on the other hand, it has done considerable damage. The sugar industry does not stand to gain anything from it, because the realisation therefrom is adjusted in the computation of the levy price of sugar. On the other hand, the rise has unreasonably jacked up the price of ALCOHOL which the various chemical industries are finding extremely difficult to absorb.

38. If we have to keep our chemicals at a reasonable price level, then there is no escaping the fact that the molasses price has to be brought down to Rs. 20/- per tonne.

39. In this connection we would like to mention that the present Molasses price of Rs. 60/- per m. tonne has an element of Rs. 20/- per m. tonne as a funding component for purpose of building storage. This has been very nearly served. Therefore the price has automatically to be brought down to Rs. 40/-. This price of Rs. 40/- is also too high and, if not bringing it back to Rs. 10/- it should be brought down to not more than Rs. 20/- per m. tonne.

40. In this connection, permit us to quote herebelow the policy guidelines given to the Government by expert bodies from time to time: —

(A) Here is what the Alcohol Committee said in 1956 (vide the Report of the Committee Ministry of Commerce & Industry, Govt. of India-Para 46 : Page 41): "Wherever alcohol is used as fuel, its price must be fixed at a level corresponding to the price of petrol. When it is to be used as a raw material for industries for PRODUCTION OF CHEMICAL PRODUCTS such as synthetic rubber, solvents etc. Alcohol should be available at the lowest possible prices. The alcoholic liquors industry can be asked to pay the highest prices for alcohol, partly because it is the desire of Government to keep down the consumption of such liquors and also because the tax levied on potable liquors is a source of revenue to the States".

(B) We also give below an abstract from the Report of the Alcohol Committee, Ministry of Commerce and Industry, 1956, page 21, under the heading "Price of Alcohol".

"The importance of a low price is even more significant when alcohol is to be used as a raw material for the production of chemical products, instead of as power alcohol in competition with other conventional raw materials like petroleum refinery gases or natural gases, here and elsewhere. Not only does it seem to be necessary for the cost of production of alcohol to be kept down at the lowest possible level but adequate steps should also be taken to make such low cost alcohol freely available for use in industrial processes or even for temporary use in motor fuels."

(C) We may also draw your attention to the comments on the Pricing Policy of Molasses by the Director of Sugar & Vanaspati quoted by the Estimates Committee (1971-72) in their 15th Report on the Ministry of Agriculture (Department of Food):—

"The Committee are unhappy to note that valuable by-product like molasses has not received due attention in regard to the storage facilities and fixing of price .....The committee suggests that the sale of molasses for industrial alcohol may be fixed at a controlled price and that for potable alcohol may be allowed to be sold at free open market price."

(D) Here is what the Tariff Commission said in their report on the cost structure of and the fair price payable to the sugar industry (1973) "While the benefit to the consumer of sugar of 10% rise in the price of molasses is negligible, it has greater impact on the cost of production of industrial alcohol which, in turn, will inflate the cost of production of alcohol-based industries." Thus even 10% rise was not approved them, leave alone 500%.

41. We have taken the liberty of quoting in extenso from various expert bodies to bring home the fact that there is no justification whatever for increase in the molasses price and the present price of Rs. 60/- (Rs. 40/- without funding element of Rs. 20/-) should be brought down to not more than Rs. 20/- per M. Tonne.

42. IMPROVEMENT OF EFFICIENCY, YES, BUT NO CESS

There is a great room for improvement in alcohol producing methods and techniques and in improving efficiencies. Better Control and Sanitation and alert scientific approach will considerably improve the results. For this purpose the industry has to be stir itself and AABIDA proposes to take up this task of betterment of results jointly with the AIDA and strive its best to achieve better performance.

43. There have been, however, some suggestions that a certain element of molasses price, instead of reducing the price, be funded as a sort of a "CESS" for Research and Development for carrying out concentrated Research for improving the results of the Distilleries. We most respectfully submit that such a step would not be in the right direction. What the industry needs is the reduction in the price of Molasses and not funding in one form or another. Whatever steps are required to be taken for the results of the distilleries would be vigorously taken. But a Research Cess would not be the correct answer. The Industry does not have happy experience of such proposals of "CESS" in other sectors where such a charge becomes part of General Revenues e.g. Salt Cess, Sugarcane Cess etc.

44. NEED FOR UNIFORMITY IN LEVIES AND IMPLEMENTING JALAN COMMITTEE REPORT

Although we have referred to the question of levies, we may be permitted to repeat that there is such a multiplicity and variety of levies on industrial alcohol in different States that it is verily difficult to even keep track of all kinds of levies or imposts on this important raw material. We would like to elaborate the point.

45. These levies assume different forms in different States but they have one common feature in that they uniformly increase the burden on the users of alcohol. These levies take different forms, viz: State excise duty, gallonage fee, vend fee, permit fee, pass fee, transport fee, entry fee, Special fee, administrative charges, etc., besides the usual sales-tax. octroi or local panchayat levies. In one State, there is also a purchase tax.

46. It needs hardly to be mentioned that there is no other commodity in the country which is subjected to such a wide and complex variety of levies. It would be apparent that the same is bound to have a far reaching and serious effect on the cost of end-products.

47. The Jalan Committee which was appointed to study this vexed question has made valuable recommendations. This Committee is reported to have recommended as under:—

> ".....in order to bring about some uniformity in the structure of levy in various States, the Committee would recommend that States may impose a single uniform levy/fee by whatever name it is called on alcohol used for industrial purposes, denatured or otherwise. Needless to add that such a levy should be at a reasonable level."

48. It is high time that steps are taken for implementation of the above recommendation, without which the alcohol-based industries would continue to remain in the "red" and would involuntarily become sick.

49. NORMAL EXPANSION TO EXISTING UNITS

Concepts regarding scale of operation are fast changing. We submit that all existing units be permitted to expand suitably to achieve economies of scale.

50. There is thinking in some quarters in some States that new alcohol-based industries should be set up only in a co-operative sector. Without raising any ideological issues, it may be mentioned that ours is a mixed economy and, therefore, there ought to be a scope for all the sectors to exist simultaneously—whether it is joint sock, co-operative, joint, or public sector. In any case, the normal growth and development of existing units should not be choked, as all the units that are existing are national assets, whatever sector they belong to.

CONCLUSION:

51. We recognise that the task before your Committee is at once challenging and fascinating. AABIDA offers you full co-operation in this great endeavour.

52. AABIDA looks forward to play an effective and catalytic role to promote new developments in the coming years. We have no doubt that your Committee —with its expertise, foresight and judiciousness, will provide the necessary future frame-work for a resurgence and for new vistas.

53. After the Nagraj Rao Committee made its first study in 1956, the alcohol-based industries initially took rapid strides but slowed down later. The covetous eyes of the exchequer and the way wardness in supplies played with its fortunes. As a result. at times rushing and gushing and often halting aid limping, the industry has been plodding its weary way jostling against many odds.

54. It is our earnest and fervent hope that your Committee will clear the way of the many thorns, shrubs and thicket so that the alcohol-based industries can look forward to a new dawn of hope and cheer leading to a bright and prosperous future.

FOR ALL INDIA ALCOHOL INDUSTRIES
DEVELOPMENT ASSOCIATION

Sd/-
(S. K. SOMAIYA)
PRESIDENT

BOMBAY:
10-10-1977

REPORT ON POSSIBILITIES OF ALCOHOL MANUFACTURE FROM MATERIALS OTHER THAN MOLASSES

Report submitted by Dr. U. T. Bhalerao, R. R. L. Hyderabad

Alcohol can be produced from (i) Saccharine, (ii) Starchy and (iii) Cellulosic materials and (iv) from Ethylene etc. by synthetic processes. With the first three categories of raw materials, alcohol is produced by the fermentation of sugars with yeast.

1. Raw materials of the first category are directly fermentable. These, i.e. sugar containing materials consist of cane sugar molasses, gur or jaggery, sugar beet, mahua flowers and juices of palm, palmyrah, date, cocoanut, apple and grape etc. Raw materials of the second category consist of carbohydrates such as starch which must first be converted to fermentable sugars by enzymatic action of malt (germinating barley). These raw materials consist of cereal grains such as corn, rice, wheat, maize, oats, barley etc., and also potatoes, sweet potatoes and tapioca.

Juices from palmyrah, cocoanut, palm and date find use in the production of country liquors known by the general term 'toddy'. In view of the sporadic growth of these trees and the low sugar content in these juices with consequential low strength of alcohol, they are not suitable for alcohol manufacture on commercial scale. Grapes and apples in view of their cost are only suitable for the production of wine and brandy. Production of sugar beet is considerably limited and does not warrant its consideration as a source of alcohol. Grains and potatoes being food stuffs command much higher prices than sugarcane molasses. Further, the starch present in these materials has first of all to be converted to sugar before fermentation is done. Owing to the present production and high prices of food grains in India, alcohol production from grains would be very uneconomical. They can only be of use in the production of potable liquors or beverages. During 1940s potatoes were used in Germany, and wheat in U.S.A. for alcohol production. The use of potatoes proved to be uneconomical in America because of the low yield of alcohol obtainable (100 Lbs. of potatoes yielding one gallon of alcohol). In addition, high transportation costs made potatoes one of the costliest raw materials for production of alcohol in that country. With sweet potatoes, an additional difficulty experienced in U.S. was the difficulty to store, then presenting a special handling problem. In the case of tapioca, the low yields of alcohol besides its limited production do not warrant its use in the production of alcohol.

Before the growth of Indian Sugar Industry, Indian distilleries made use of gur or jaggery and mahua flowers (of Madhuca Indian longifolia). Mahua flowers contain 57 per cent of fermentable sugars and are a good source for production of alcohol. An average yield of 90 gallons of 95% alcohol is reported from one tonne of dried flowers. But the availability of these flowers is inadequate to sustain regular production of alcohol commercially. Seasonal availability, storage problem and the cost involved in collecting and transporting the material on an organised basis are other factors which restrict the use of these flowers for commercial production of alcohol. Actually, alcohol was produced during the past from these flowers in the distilleries (Andhra Pradesh; Kamareddy and Narayanaguda). A view was expressed that it is neither economical nor practicable to regularly produce alcohol on a commercial scale from these flowers unless large scale production and collection of flowers in organised manner is undertaken. Hence, this was given up. These flowers serve well for the production of potable liquors.

2. Cellulosic materials of the third category are converted to fermentable sugars by digestion with mineral acids. These materials consist of wood pulp and wood wastes, saw dust and agricultural residues. Sulphite waste liquor produced during pulp manufacture is also another source coming under this category.

Although cottonseed hulls and groundnut shells and sugar cane bagasse have at one time or another, been proposed as potential sources of alcohol, only

11—1 M of PC & F/ND/78

wood pulp and wood wastes have been investigated. The yield of alcohol (95%) was 20-23 gallons per tonne of wood/sawdust (U.S. figures), Sulphite waste liquors from pulp manufacture contain only 2-4% of sugars of which about 65% is fermentable to alcohol by yeast. The alcohol obtained from this source was not always of high purity. Yields of 18-22 gallons of alcohol per tonne of pulp produced were claimed. According to expert opinion, these yields were too low to achieve economic success and hence research inputs are essential in this area.

STATUS FOR RESEARCH

CSIR had sponsored a project on the utilisation of cellulosic wastes in the Silver Jubliee Year, at 3 centres namely National Chemical Laboratory, Poona, Indian Institute of Science, Bangalore and Central Food Technological Research Institute, Mysore. The Project worked for about 4 years and recorded significant progress in the following areas.

I Cellulose production

II Protein production

III Enzymic Saccharification of cellulose

IV Basic Studies

At the National Chemicals Laboratory, Poona.

After screening several hundred cultures nine potent cultures were selected for standardising conditions for Enzyme production. Potent enzymes have been isolated which can degrade filter paper effectively. Enzymes of high activity have been produced which can degrade cellulose at 30% level and convert it to glucose.

At C.F.T.R.I. Mysore

Optimum conditions have been worked out for producing microbial protein utilising straw as the carbon source. Large scale production of protein from treated straw has been completed. Studies are in progress at a few other centres to produce cellulose degrading enzyme.

Prospects and projections

The entire problem of utilisation of cellulosic wastes is examined under two broad categories namely (i) cellulose producing various other commodities like, protein, fructose, ethyl alcohol, methyl alcohol and methane.

(i) Cellulose degradation

(a) Enzymes of high activity have been obtained by NCL group and other workers but their application has been confined to treated substrates. Treatment of natural substrates is an expensive step. Further progress is slow because of this difficulty. Work is in progress.

(b) Fermentation of cellubiose in normal sequence inhibits further breakdown of cellulose and hence continuous removal of cellubiose is essential to ensure maximum cellubiose break down. Immobilisation of cellubiose for breaking cellubiose is practised with success. Large scale production of such systems must be taken up.

(c) Production of ethanol, methanol or methane is a straight fermentative process which is being looked into but enough weightage is not given to the problem. The Committee can recommend that the priority may be assigned to this problem so that the commercial viable process may emerge out in relatively short period.

In view of the huge bulk of cellulosic wastes available in the country, intensive programmes to work out all aspects enumerated previously should be taken up. By working out an integrated programme it should be possible to produce many important strategically vital commoditics; at the same time it eliminates the common environmental polluants. This is perhaps one of the few areas where the waste material offers good scope for its utillsation for other end-products.

Central Food Technological Research Institute, Mysore, has taken up a project to work out a simple technology for upgrading the feeds and to produce glucose which can be used as the case for fermentative production of a variety of essential commodities. National Chemical Laboratory is engaged for quite sometime on the basic aspects of enzyme production and its application. Structural changes of cellulose during pretreatment as well as enzymatic degradation are proposed to be taken up at the Indian Institute of Science, Bangalore.

3. Ethylene from coke oven gases (as per German practice) or from vapor-phase cracking of petroleum (as per U.S. practice) can be converted to alcohol by hydration by a synthetic process. Another synthetic process consists of partial combustion of natural gas to a mixture consisting of largely carbon monoxide and hydrogen and passing then over a catalyst to form alcohol. But this process has not proved to be commercially successful.

The production of synthetic alcohol from ethylene has made considerable progress in Germany and U.S.A. The current synthetic production of alcohol in America far exceeds the production by fermentation. Synthetic alcohol is also produced in Denmark, Holland and U.K. Synthetic alcohol produced from Ethylene resulting from the cracking of petroleum hydrocarbons may probably turn out as the cheapest source of alcohol in many countries.

A NOTE BY SHRI Y. V. S. S. MURTY
ON
ALCOHOL BASED CHEMICAL INDUSTRIES

INTRODUCTION

Fermentation of sugars/cellulosic material leads to alcohol and this is about the cheapest source today. Conversion of this alcohol to ethylene compares well in economics with that obtained from modestly sized naphtha crackers (10,000 tpa). A rigorous economic analysis was published in Hydrocarbon Processing in 1976/77 in support of the above statement.

In India, bulk of the alcohol is produced by fermentation of molasses (1 tonne of molasses yields about 250-300 litres of 95% alcohol). The primary use to which this alcohol is put to, appears to be, for the manufacture of arrack. Perhaps it is prudent to embark on slightly costlier raw materials (like tapioca starch celluloses) for alcohol manufacture meant for arrack, as the cost difference can be easily absorbed.

Present uses of alcohol:

As mentioned before, the bulk use is for arrack preparation and the revenue to State Governments is sizeable. This is partly the reason why the State Governments are reluctant to divert the alcohol for chemicals.

The other use is for the manufacture of small quantity of chemicals listed below:

(i) **Acetaldehyde:** By air oxidation of alcohol using silver catalyst—Almost all the plants in the country employ this process.

Acetaldehyde is subsequently converted to acetic acid or a combination of acid and anhydride (ASL, Tanuku), butanol, 2-ethyl hexanol etc. (Barabanki).

(ii)	Ethyl acetate	: ASL, Tanuku & Union Carbide.
(iii)	Acetone	: Cordite factory, Aruvankadu Sirsilk, Khagaznagar.
(iv)	Polyethyene	: IGI, Calcutta.
(v)	Butadiene	: Synthetics & Chemicals, Bareilly.
(vi)	PVC	: From alcohol through ethylene.
(vii)	Ethyl Benzene & Styrene	: Hindustan Polymers, Vizag and others

Potentiality:

In view of the recent economic analysis on ethylene based on alcohol vis-a-vis that derived from naphtha, the costs compare well. Therefore, it is desirable to base chemical industries on alcohol and/or ethylene derived therefrom. The loss in revenue to the State Governments by:

(i) realising some in the form of excise on alcohol produced from costlier raw materials such as starches, cellulosic material etc.

(ii) balance amount from the taxes on the chemicals manufactured from alcohol derived from molasses or alternatively raising the molasses price to a reasonable value by levying excise or a similar tax or both—A reasonable tax structure has to be worked out. The intangible benefits are much more such as:

(a) Employment potential;

(b) Indirect taxes on downstream products based on chemicals derived from alcohol;

(c) Diffusion of capabilities into each state.

Suggested new Chemicals:

In addition to catering to the existing chemical industries, the alcohol could be used to manufacture the following chemicals. Technology may not be readily available and there is nothing wrong in importing it if expediency warrants or the national laboratories may be requested to undertake the challenging task of development on a priority basis.

(i) **Propionic acid :**

Alcohol + Carbon monoxide $\xrightarrow{\text{Catalyst \& Pressure}}$ Propionic acid

Propionic acid finds use among others, in the manufacture of a pesticide Delapon.

(ii) **Butanol and 2-ethylhexanol:**

Technology may be borrowed from Barabanki or else could be easily developed. Scope for another one plant or two exists.

(iii) **Ethylamine:**

Funds use in pharmaceuticals, resins manufacture etc.

One plant of 150
200 TPA is in operation. Scope exists for one more plant.

$$\text{Ethanol} + \text{Ammonia} \xrightarrow[\text{Pressure}]{\text{Catalyst}} \text{Ethylamines.}$$

(iv) **Acetone :**

Scope exists for one or two plants.

(v) Alcohol ----> aldehyde ----> Acid ----> Ketene ----> Diketene ----> Derivatives.

Scope exists for one or two integrated plants for diketene and its derivatives because of demand of pesticides.

(vi) **Ethylene & its derived products :**

It is desirable to think of modules of 3,000 to 6,000 TPA of ethylene from alcohol depending upon location and availability of alcohol and base some of the following downstream chemicals.

(a) **Propanol**

Ethylene + CO + H_2 66 Pressure Propionaldehyde ——Catalyst

Propionic acid → Propanol

(b) Ethylene + Oxygen ——> Ethylene Oxide

NH_3

Morpholine ——> Ethanol amine

CH_3 OH
Catalyst

Methyl morpholine

Items enclosed can serve as saleable products.

(c) Ethylene Oxide + Alcohol → Ethylene glycol ether and Polyglycol ether

(d) Ethylene + Cl_2 ——————→ Ethylene dichloride

Ethylene diamine tetra acetic acid (EDTA) ← Monochloro acetic acid ← NH_3 Ethylene diamine

(e) Ethylene + Cl_2 + H_2O ——————→

Ethylene chlorohydrin

A valuable product, demand is of the order of 400-660 TPA.

(f) **Ethylaniline :**

Aniline + Alcohol ——————→ Ethylaniline

or

C_6H_6 ——————→ in dyestuff industry

(g) Small sized units of PVC based on Ethylene (6,000 TPA or near) instead basing them on acetylene which is expensive as derived from carbide (nearly Rs. 6-7/Kg. of acetylene).

COMMITTEE TO CONDUCT STUDY AND MAKE RECOMMENDATION FOR THE DEVELOPMENT OF INDUSTRIES BASED UPON ETHYL ALCOHOL

RESEARCH WORK DONE ON PRODUCTION OF ALCOHOL BASED ON SOURCES OTHER THAN SUGARCANE MOLASSES

Prof. Dilip Dutta, Head of the Dept. of Chemical Engineering, Prof. B. C. Chanda, Chemical Engineering Dept. and Prof. S. K. Majumder, Head of the Dept. Food Technology and Biochemical Engineering, Jadavpur University, have been interviewed on 11-7-1977.

The work so far done at the Jadavpur University is of little significance. A party from Agartala (Tipperah State) approached Dr. Majumder to explore that possibility of deriving alcohol from jackfruit and pineapple for developing various grades of wine and Prof. Majumder had carried out some experiments on the subject but the party did not eventually evince much interest and, therefore, the work had not been pursued. Although pineapple and jackfruits are available in abundance in Tipperah, the viability of large scale production of alcohol from these fruits which are in great demand in other parts of the country, is rather remote.

Satti roots, a kind of Barley, akin to Turmeric roots grow abundantly in and around Agartala and Dr. Majumder confirmed that alcohol could be developed from these roots, here again, large-scale production was ruled out, nevertheless, requirement of a small brewery could be possible and there is still a proposal for setting up of a brewery at Agartala.

Dr. Majumder, during the discussions, referred to certain proposals advanced by the West Bengal Industries Development Corporation for manufacture of alcohol by distillation of wood but at the same time he pointed out, the cost of production of such alcohol if at all materialises, would be rather prohibitive and consequently unsuitable for industrial purposes.

Dr. Majumder, if approached and invited, might consider meeting the Chairman and the members of the Committee for detailed discussions. The meeting at Lucknow on the 27th July '77 might be suitable for such a dialogue with Dr. Majumder if considered necessary.

A. B. ROYCHOWDHURY

13-7-1977.

Views of Experts

(1) Views of Dr. Ramachandran. Head of the Research and Development, Hindustan Antibiotics Ltd. on the subject of Recent Advances on Fermentation Technology.

Regarding the feedstock for conversion to alcohol by fermentation process he stated that Carbohydrates. Fatty acid, lipids and proteins were the suitable materials. He stated that by proper selection of yeast the conversion of the feed stock could be increased considerably. If unfermentable sugar present in the molasses is isolated a suitable yeast culture that will attack this portion to convert it into alcohol can be found. In an another suggestion he stated that the distillery waste can be reinoculated with a suitable culture. The sugar content in the waste can be brought down. This will reduce the pollution. By selecting suitable cultures it was possible to have mixed fermentation at the initial stages to reduce the residual sugar in the wash to about 2%. He suggested development and research work for (1) Improved fermentation by proper selection of cultures. (2) Improved alcohol recovery by applying chemical engineering principles. (3) Introduction of mix cultures for fermentating the residual sugars which at present are left as uncoverted sugars. (4) Designing of less capital intensive plants by chemical Engineers.

Regarding type cultures he stated that arrangement should be available to evaluate the performance of the cultures under various conditions to verify the rate of fermentation, stability to higher temperature, achieving higher percentage of concentration of alcohol in the fermentors and suitability to the kind of water available and the salts present in the respective molasses. He advocated that based on these conditions each distillery should develop and preserve its own type culture. If concentration of alcohol in the fermentors is 10-12% the capacity of the distillery gets increased and the quantity of effluent per litre of alcohol produced is reduced.

Regarding treatment of effluent he stated that aeration of effluent will reduce the total period in the lagoons. He suggested that production of methane should be done on the lines of gober gas plant to reduce pollution. It gives a valuable fuel to the nearby places.

The by-product Carbondioxide can be utilized in the green houses for the high priced crops such as tomatos. It was a modern trend to feed carbondioxide in the green houses for better conversion by photo synthesis to grow vegetables. He recommended that fermentor should be covered and there should be slight agitation to make the reaction faster.

In connection with the alternative sources for alcohol by fermentation process, he mentioned manihol a plant which contains four times a Tapioca per acre the quantity of starch. Regarding utilization of wood the main problem was removal of lignin present in the wood. Fast growing soft balsam woods low in lignin content should be selected. He referred to Prof. Erichson who has advocated a wood chop-pile fermentor which is a continuous fermentor in conversion into sugar from such woods. According to him conversion of sugarcane to alcohol would not be feasible due to several problems.

Other sources for alcohol could be xylans and pectins. For removal of lignin in wood. he suggested use of micro-organism such as wood retting fungii. They digest lignin to produce secondary metabolic products such as catechol. phenol, vanilin etc.

He has indicated that research and development work to apply biochemical engineering methods for production of alcohol by alternative source can be undertaken in the Research and Development Division of Hindustan Antibiotics Ltd. Poona.

(2) Views of Prof. T. K. Ghose of Department of Bio-Chemical Engineering of the Indian Institute of Technology on Recent Advances in Bio-Chemical Engineering.

Prof. Ghose stated that I.I.T. Delhi was one of the very few places in India where the fermentation processes are being studied from the point of view of bio-chemical Engineering. Considerable work is being done in the Department to cover a very wide range of subjects. A few months ago an international Symposium on bio-conversion of Cellulosic substances into chemicals was held at the Institute and papers on various subjects were discussed. The detailed papers discussed will be published shortly. Prof. Ghose stated that they have several strains of yeast culture each of which may be superior in various respects to the cultures used in industry. On being asked whether culture that will withstand higher temperature and or will give higher percentage of alcohol concentration in the wash, he answered in the affirmative. The Department can be approached for improved cultures for alcohol.

The department has done some work for conversion of various cellulosic materials into alcohol. A set of papers giving broad details for conversion of cellulose to alcohol has been prepared. Cellulose Enzyme is prepared from glucose. The Enzyme so developed, is then made to react with Cellulosic material for conversion into alcohol. Prof. Ghose stated that it was necessary to have pilot plant trials to work out this scheme to evaluate its economics and yield pattern. He invited attention of the Government and the Industry for this purpose and suggested that it would be necessary to spend about Rs. 8 to 10 lakhs to install a pilot plant and complete studies at the Institute. On the other hand he was prepared to sell the present investigation to any party which can exploit it further. He offered all his help for any agency that would undertake to finance this work.

Regarding the alternative sources for fermentation to convert it into alcohol, he stated that rice husk, jute stems and reeds of various crops could be utilised for converting into Ethyl alcohol. Regarding the action of certain insects on wood, he stated that it is possible the enzyme present in white ants may be useful to convert wood into sugar. Prof. Ghose has worked out experimentally a scheme to convert the bagasse into alcohol. However, he was not able to say whether the cost of conversion would compare with that of molasses. In case of all his eperimental work and schemes it was necessary to undertake pilot plant trials. In the end Prof. Ghose expressed his willingness to take part in any of the discussions if he was invited.

The schemes submitted by Prof. Ghose are attached for reference.

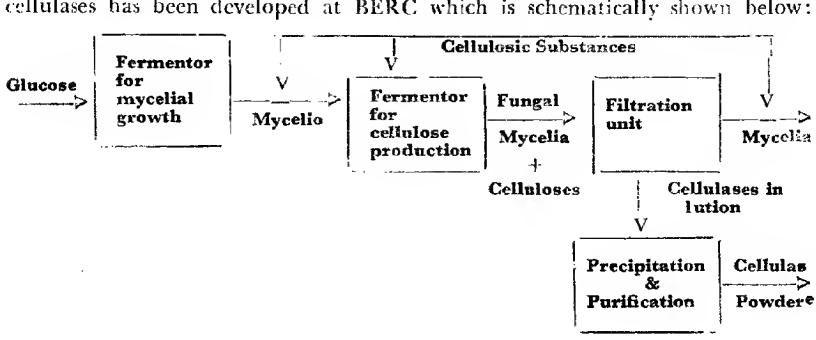
Biochemical Engineering Research Centre Indian Institute of Technology. Delhi.

PROJECT INFORMATION

March 1977

Project No. 1. *Continuous Cellulase Production*

Availability of active cellulolytic enzymes is a prerequisite for saccharification of cellulosic substances. A process for continuous production of *Tv.* cellulases has been developed at BERC which is schematically shown below:



In the first reactor, the fungus (*Tv.*) is grown on glucose to produce an adequate amouot of fuogal biomass. This biomass is transferred to a second reactor where cellulose is supplied continuously. Cellulose acts as an inducer for cellulose biosynthesis. The culture filtrate containing the cellulases is separated from the mycelia by a simple filtration/centrifugation operation. The filtrate can either be stored at 4°C as such for subsequent use or the enzyme precipitated, purified and obtained in powdered form. The mycelia can either be recycled to cellulose-reactor or used as animal feed.

For each kg. of dry cellulase powder produced, 6-7 kg. of pure cellulose is required in this process. This enzyme protein is capable of hydrolysing 70 kg. of treated bagasse (having 80% total celluloses) in a 10% slurry in 48 hours, thus producing nearly 60 kg. of mixed sugars. The enzyme has heen very successfully applied to a variety of cellulosics, for their hydrolysis the most important being bagasse, the sugarcane waste.

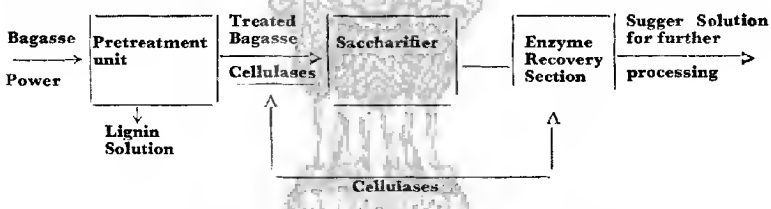
Biochemical Engineering Research Centre Indian Institute of Technology, Delhi.

PROJECT INFORMATION

March 1977

Project No. 2: Bagasse Saccharification

Bagasse is a native cellulosic waste material, obtained from cane sugar, and is available in plenty in India. It contains, in addition to cellulose, hemicellulose and lignin. Technology foi the saccharificatioo of bagasse to produce sugais and other chemicals, has beeu developed at BERC, and is schematically shown below:



Since most of the cellulases are not capable of degrading lignin, and since lignin degradation in the same saccharifier is not desirable also because of resulting contamination of sugars by lignin-degradation products, it is removed from cellulosics by a pretreatment process. Milled bagasse is suspended in caustic soda solution, 1-2% concentration by weight, for 90 minutes at 70°C. The residue is filtered and washed thoroughly, and dried. This treated bagasse (80% cellulose) is then saccharified in a fermentor at a pH of 4.8 and a temperature of 50°C. Upto 10% bagasse suspension can be used in saccharifier using cellulases. Under these conditions 1 kg. of dried *Tv.* cellulase, in a concentration of 0.2% wt/volume, can hydrolyze 70 kg. of treated bagasse. In this process, nearly 60 kg. of mixed sugars (dry weight) are obtained. The composition of these sugars is 60-65% glucose, 30% cellobiose, and the rest are pentoses, primarily zylose.

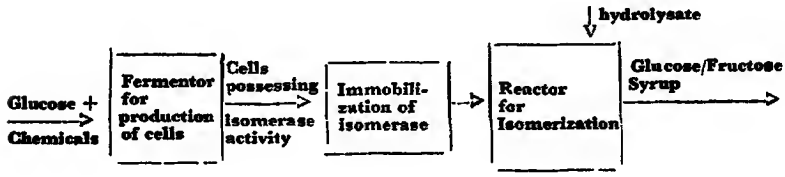
Enzymes being very expensive are recovered in the enzyme recovery section and recycled to the hydrolyzer. The sugar solution ($\sim$ 8% sugars) can be processed either for production of chemicals (ethanol or SCP) or for pure sugars.

Project No. 3: Microbial Isomerization of cellulose hydrolysate into glucose/fructose syrup

Glucose/Fructose syrup are being increasingly used as sweeteners in different parts of the world. These are presently being produced mainly by inversion of sucrose. Their value as sweeteners lies in the fact that fructose is

12—1 M of PC&F/ND/78

1.73 times sweeter than sucrose and more than twice as sweet as glucose, Glucose being the main sugar produced by enzymatic hydrolysis of cellulose materials. It can be isomerized enzymatically to glucose/fructose mixture. This product finds usage in foods, beverages, and pharmaceutical industry. A process for isomerization has been developed at BERC and is shown schematically below:

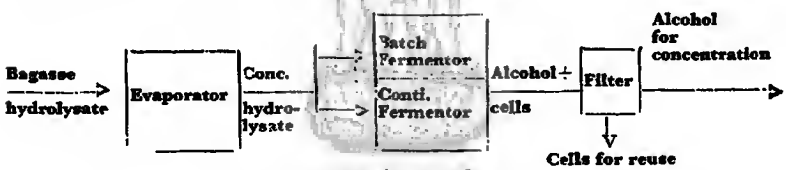


Cells processing glucose isomerase activity are obtained in a fermentor by growing the micro-organism on glucose in presence of an inducer. These cells are then subjected to a suitable heat treatment process so as to retain only isomerase activity; these are then immobilized. The immobilized cells are used in a specially designed packed bed reactor where hydrolyzate containing 36% glucose (obtained either by concentrating the hydrolysate or employing glucose syrup from corn) is brought into contact with the immobilized cells. Isomerization process converts 43% of the glucose as a result of contact of glucose with the immobilized cells within the reactor.

The process is a continuous one.

Project No. 4: Production of Ethanol from Bagasse Hydrolysate

In view of the present energy crisis, novel raw materials for production of ethanol are being searched. Enzymatically hydrolysed bagasse in 10% suspension, contains 6-7% (by weight) total reducing sugars; it offers an excellent raw material for ethanol production. A novel process has been developed at BERC, which is schematically shown below:



Bagasse hydrolysate obtained from enzymatic process can be used at such or concentrated to 28% sugar concentration for ethanol production. The 28% total sugar containing stuff corresponds to 20% glucose (fermentable sugar). Batch fermentation of this concentrate products 9.2% ethanol representating a 91% conversion efficiency.

Production of ethanol from hydrolysate compares very favourably with the traditional method from molasses. The present fermentation reduced the time of fermentation to almost half of that required with molasses as raw material. Because of extremely low solid content in this case, fermentation can be carried out at higher sugar concentration resulting in high ethanol concentrations in the product. The problems of scaling in the stills are also reduced to a great extent in the present case.

From one ton of treated bagasse nearly 280 litres absolute ethyl alcohol can be obtained.

(3) Following is the summary of the view of Shri D. M. Trivedi on the alcohol industry and products based on alcohol.

Mr. Trivedi was of the view that even though a decision is taken that the all sugar factory molasses should be utilised for production of industrial

alcohol and all Khandasari molasses should be reserved for production of liquor, it will be difficult to implement the proposal. Sugar Factory molasses are bound to find their way somehow for production of liquor. Therefore the production of liquor should be preferably done in the Government controlled distilleries. Atleast in future no new licences should be given to the private parties or co-operatives. The production of units for industrial alcohol and liquor must be bifurcated. The production units can be kept under full supervision and control of excise and the industrial alcohol units should be made free by tyranny of Excise control. All Khandasari molasses should be taken over by the Government and utilised for liquor production. All distilleries should produce denatured alcohol, so that there would be no need of Excise control.

The distillery units that are run efficiently should be given liberal supplies of molasses. He observed that even though the distillery industry was crying that they were making loss, no distillery has closed down because of losses.

Regarding the views of yield of sugar cane per acre, when pointed out that in Tarai the yield of sugar cane per acre was highest. He stated that the content of sugar in that cane was as low as 7.8%. He stated that the best yield of sugar cane was in the areas of Maharashtra, Andhra Pradesh and Karnataka. He stated that the yield of sugar cane was very low in U.P. and the industry should not be allowed to expand any further in U.P. He stated that the production of sugar from U.P. used to be 40-50% which has now come down to 33 34% on all India basis.

In his opinion as the urbanisation goes on and the standard of living rises the internal consumption of sugar will steadily increase and the consumption of Ghur will come down. At the moment 60% of sugar cane goes for Ghur and 30% for crystal sugar. However the policy of the present Government appears to be to encourage production of Khandasari and Ghur. In his opinion, encouragement to Khandasari and Ghur results into loss of sugar in the sugar cane. The extraction of sugar from sugar cane is 50% compared to that in the production of crystal sugar. Due to inefficient working sugar is left in bagasse which are subsequently burnt.

He stated that if delivered prices of alcohol goes beyond Re. 1/- per litre, it would not be feasible to produce chemical based on alcohol.

Mr. Trivedi agreed that there was some sense in classifying into two groups product based on alcohol such as Acetic Acid, Acetaldehyde Group and Polyethylene, Styrene Group. If new units have to be planned for production of Polyethylene or Styrene of Butadiene the capacities have to be large to have the economy of scale of the present day. A very large quantity of alcohol will be required by each of such unit. Such a large quantity would not be available in the nearby areas and alcohol will have to be transported over long distance to reach this unit and the cost would be prohibitive. On the other hand the production of these chemicals from the petroleum based cannot be completely ruled out inspite of rising prices. He said that under no circumstances whatever may be the cost India will have to import petroleum crude to manufacture middle and heavy fractions. The consumption of Naphtha for chemical purpose is a very small fraction of the total usage of petroleum products. Another advantage of Naphtha was along with Ethylene, one gets other by-products which are required for the manufacture of various other things like artificial fibre, etc. The price of petroleum crude which is at present $ 11-13/Barrel may go upto $ 20/Barrel in the next 15 years. After this rise the price is again expected to come down because by that time all over the world alternative sources of energy would have been developed. It should be noted that the major consumption of petroleum was for generation of energy in various forms. In the product like Polystyrene the price of Benzene has more influence than the prices of alcohol. In the case of PVC the price of Chlorine accounted for 60% and only a small capacity plant has an advantage of alcohol as a feed-stock.

In todays economy it was not justified to have alcohol-based plants for butadiene.

Mr. Trivedi stated that against a consumption of 30 million tonnes of petroleum products for energy, the consumption for production of chemicals was only 1 million tonnes. Therefore we should not sqeeze our economy by producing iteme like synthetic fibre with alcohol. The real saving in petroleum products would be in the field of energy and not in chemicals. We should extract from petroleum, Benzene, Toluene, Xylene and Wax and produce value added products instead of burning petroleum products for energy.

He suggested that in case we produce alcohol surplus to our requirements, we should export it as potable alcohol which is 3 to 4 times costlier in the world market than synthetic alcohol.

(4) Views of Shri S. L. Venkateswaran, Consultant.

Regarding the schemes prepared by Prof. S. K. Ghose, Head of the Department of Bio-Chemical Engineering of Indian Institute of Technology, New Delhi, he was of the opinion that the information given was very preliminary. In his opinon a lot more work was required to be done. In any case these schemes cannot be implemented by the industries with the information available at present. This work can be referred to the NCST and the National Chemical Laboratory. The NCL can develop it into a full scale scheme and after establishing the processes and know-how, it can be scaled up like other schemes offered by NRDC. At this stage the party interested in utilising the know-how can purchase the schemes from NRDC.

Regarding the yeast culture utilized by the alcohol industry, Mr. Venkateswaran was of the opinion that the yeast provided was suitable for the alcohol industry. When it was mentioned to him that according to the views of the experts in fermentation technology the yeast marketed by the Indian Yeast Company was basically designed for manufacture of bread and as a food yeast, Shri Venkateswaran replied that there was not much point in that statement as we can see actually that the yeast was producing alcohol in the various distilleries and some of them were achieving quite a good performance. In his opinion things as they were, were satisfactory.

His suggestions for improving the production of alcohol, were that the aim should be to improve agriculture and thereby grow more sugarcane per acre and also improve the sugar content in the sugarcane. This is a more profitable way to improve the production of alcohol. According to him there was a lot of scope in improving a yield of sugarcane and also modernising the present distilleries. He stated that the present distilleries were working on old practices, and had become uneconomical. On increasing the sugar prodution one may keep more percentage of sugar in molasses, and recover less crystal sugar and produce larger quantities of molasses for the alcohol industry.

In his opinion utilisation of alternative feedstock for fermentation process, would be more expensive in comparison with molasses and more research and development work is required. It may be alright as a long-term plan which may give results after 15 to 20 years. It was not possible to rely upon the new sources atleast for another 10 years.

Shri Venkateswaran was of the opinion that Khandsari units are spread in remote corners and many times not easily accessible. It would be more practical to ulilise Khandsari Sugar molasses for potable liquor and ulilise sugar factory molasses exclusively for production of industrial alcohol.

Shri Vekateswaran stated that when the sugarcane production increases to a satisfactory level the recovery of crystal sugar from the sugarcane can be reduced to leave more sugar in molasses and thus boost up alcohol production.

He was of the view that the alcohol deficit States should go in for alternative sources of alcohol.

On controls, he stated that as far as the Industries Development and Regulating Act was concerned any product of industry comes entirely under the jurisdiction of the Central Government. The present interference by State Governments can be avoided. Jurisdiction of the States was limited only for the potable alcohol.

(5) Views of Dr. Jaganathan of National Chemical Laboratory, Poona and Dr. Gopalkrishnan of Hindustan Antibiotics.

At present a few alcohol distilleries were using their own culture of yeast while a majority of them were using a culture supplied in a wet compressed formed by Indian Yeast Company. It was the opinion of Dr. Jaganathan that yeast supplied by Indian Company was produced basically for bakers and for food purposes. It was felt that distilleries should take the most suitable culture and preserve it for their use. Several type cultures were available from which each distillery can make a selection depending upon their working conditions. After selecting the yeast culture it is available to generate it in their own establishment. The factor determining the selection were (1) type of molasses, its mineral contents, (2) climate of the place, (3) the type of water used in the area. Cultures which are capable of withstanding the extreme temperature variation in the region from winter to summer would be available. It was necessary to conduct trials to evaluate the performance of yeast under the various factors and select the best culture. It will be necessary to take the help of specialists for evaluation of the performance. The cultures react to Osmophylic Tension, Osmotic Tension, Salt present in the wash. The optimum temperature range was 35 to 37°C for the best rate of fermentation. The rate of fermentation (the total period) the maximum concentration of alcohol reached, and the sugar left unconverted in the wash were factors to be looked into for the performance. If more sugar was left in the wash that would give rise to an effluent problem because it would take BOD from the water.

It was stated that a couple of years ago, the National collection of type culture with National Chemical Laboratory was supplying type culture free of charge to the distilleries. When they started to charge a nominal price, the clients dropped from 30/40 to 5 to 6 at present.

Dr. Jaganathan stated that by-product carbon-dioxide produced in the distillery can be used for high value crops such as sugarcane, tomato etc. to provide the biosynthesis by absorption of carbon-dioxide.

It was the opinion of both Dr. Jaganathan and Dr. Gopalkrishan that fermentors should be covered to prevent formation of wild yeast, wild yeast gives rise to Aldehydes. The cover can be as simple as a sheet of polythene which can be removed whenever the vessel was required for cleaning.

Discussing the effluent treatment it was stated that removal of yeast from the wash by centrifuge would lower BOD as yeast takes oxygen to live. This will reduce the period of lagooning.

Regarding alternative sources it was mentioned quick growing tree wood, groundnut husk, grain husk can be used. Removal of lignins from the material was a major problem. At present technology was not available for alternate methods. It was required to conduct research for (1) Optimum fermentation conditions, (2) Vacuum fermentation process. (3) Treatment of effluent.

REPORTS OF VISITS TO DISTILLERIES

A Visit to Trichy distillery and Shakthi Sugar Mills was arranged. On 23rd June, 1977 Trichy Distillery was visited and Shakthi Distillery was visited on 24th June. The officers were as follows:

(1) Dr. K. S. Tiwari, M. E. O., Min. C & F.

(2) Shri A. D. Patankar, Sr. Technologist, HOC.

(3) Shri Ramachandran of Trichy Distillery representing A.I.D.A.

The observations are as follows:

(i) Method of storage for molasses

The Trichy Distillery are using storage tanks made out of bricks and concrete. They have three large storage tanks and the tanks are covered with corrugated Asbestos Cement sheets. There is no leakage of molasses through the masonry work. There was no roof leakage from the roof. The tanks appeared to be very satisfactory for storage of molasses and are cheapest material of construction for storage of molasses. The cost of the storage tanks works out to be Rs. 80/- per tonne of molasses as reported by the distillery authorities. The requirements of molasses for the factory is 60,000 tonnes while the storage capacity is 23,000 tonnes distributed in three tanks. The quality of molasses received by the distillery is as follows:

1st Grade	86.7%
2nd Grade	5.9%
3rd Grade	3.6% and
4th Grade	3.8%

The total quantity of molasses processed in the year June 1976 to 1977 was 5,465 tonnes. The average content of fermentable sugar in molasses was 44%.

DISTILLERY WORK

The rated capacity of distillery is 13,600 KL per year based on 330 working days of a year. They have achieved a maximum production of 14,300 KL of alcohol in one of their best periods. The feed of molasses is at 18 to 19 brix. It is diluted to 14 brix when it is sent to the main fermentation. They use compressed yeast supplied by Indian Yeast Company Ltd. They have four pre-fermenters each of 3,500 gallons capacity, ten fermentors of 14,000 gallons capacity each. The distillery efficiency is of the order of 98% and fermentation efficiency is between 82 to 83%. The losses for the spent wash are about 0.08%. There is arrangement for cooling the fermenters by circulating water through heat exchangers. The fermenters are covered and Co2 gas is collected in cylinders and supplied to nearby towns.

EFFLUENT DISPOSAL

The distillery has implemented the best known method for disposal of the effluent of a distillery. Using the principle of gobar gas plant they are generating methane gas from the spent wash and then the spent wash is sent to lagoons for further degradation and disposed of later on.

SHAKTI DISTILLERY

STORAGE OF MOLASSES

The distillery has a sugar unit attached to it. They have storage tanks of concrete as well as of steel for storage of molasses. The storage tanks made of concrete appeared to be quite suitable, there is no loss of molasses due to leakage through the tanks. The tanks are covered with Asbestos cement sheets. They have enough capacity for storage of molasses. Their annual requirements of molasses are 60,000 tonnes. They store 14,000 tonnes in masonry tanks and 6,000 in steel tanks.

The distillery appeared to be very well maintained. The fermentors have been provided with an arrangement of spray cooling by water-jets to control the temperature of the fermenter. The fermenters were of open type while the fermentors in the Trichy distillery were covered. The Trichy distillery recover Carbondioxide Co2 during the fermentation process and compress into cylinders as a by-product. The average fermentation efficiency is 83% and the average distillation efficiency is 98.8%.

EFFLUENT TREATMENT

The distillery is disposing of effluents without causing pollution of any neighbouring area. However, they do not have a special treatment device. They dilute the distillery wash by adding fresh water by 10 times and thus lowering the PH. The diluted water is used for irrigation of sugarcane crop where it serves as a fertilizer for the sugarcane crop. It has produced good results on the yield of sugar-cane crop per acre as reported by the distillery staff.

GENERAL OBSERVATIONS

Both the distilleries were well maintained and were running quite efficiently. The yield of alcohol per Metric Tonne of molasses consumed was about 220 to 230 litres which is a fairly good average. The lower utilisation of the distillery capacity are attributed to two reasons:

(i) Non-receipt of molasses in the distillery from other sources in time. There are several occasions when the distilleries in this area are short of molasses and the distillery has to be stopped; and

(ii) The other reason for low utilisation is that the off-take of alcohol produced is not regular and the distillery has to be stopped because the storage tanks were full.

Report of the visit to the distilleries of Kolhapur Sugar Mill & Shethkari Sahakari Sakhar Karakhana Ltd. Sangli by Shri A. D. Patankar & Dr. K. S. Tiwari & Shri P. K. R. Nair (AIDA).

Shri A. D. Patankar & Dr. K. S. Tiwari along with Shri P. K. R. Nair visited the distilleries of Kolhapur Sugar Mills and Shethkari Sakhar Sahakari Sakhar Karakhana Ltd. Sangli on 19-7-77. The Sangli distillery has a capacity of 65,000 gallons per day of alcohol and the requirement of molasses is 40,000 tonnes per year on the basis of 300 working days. They have a licence for 10,000 gallons per day of industrial alcohol which is not yet implemented. When implemented the requirements of molasses will be 60,000 tonnes per year.

STORAGE OF MOLASSES

The tanks are underground, the roof being above ground. The distillery has 5 masonry storage tanks covered with corrugated sheets for storage of molasses. The total capacity of these storage tanks is about 65,000 tonnes. However, the conditions, of these tanks is not satisfactory. The brick walls have corroded, water from surrounding earth seeps into the storage tanks. The management desires to discard the masonry storage tank because of this reason. They had an open pit for storage of molasses which is now being discarded.

They have under construction two storage tanks of mild steel each with a capacity of 5,000 tonnes of molasses. The cost of each of these tanks was stated to be Rs. 4 lakhs which appears to be a very moderate cost.

FERMENTATION HOUSE

The distillery has 10 fermentors each with a capacity of 1,80,000 litres. The pre-treatment of molasses is started at 18 Brix (sp. gr. 1,080-90), the final fermentors are operated at 22 Brix (sp. gr. 1,030-40). It was stated that in summer the sp. gr. operation is slightly at a lower value resulting in lesser yield. The distillery Manager stated that yield of alcohol per tonne of molasses in summer is between 217 & 222 litres per tonne of molasses while in winter it is 230-240, all the figures have been expressed at 95% alcohol. The fermentation house looked to be very shaby, unclean and improperly ventilated.

There appears to be no control on temperature of the fermentors. There was no provision of cooling of fermentors. It was stated that they propose to install heat exchangers and circulate the wash. The distillery at present is using their own molasses.

ALCOHOL DISTILLATION

The distillation columns were not lagged. The distillation efficiency ranges between 96% to 98%. The fermentation recovery ranges between 82% and 83%. In the monthly statements of the working of the fermentation and distillation sections it has been stated that the fermentable sugar present in.

The differences between the figures of total sugar and fermentable sugar appears to be abnormal. The reason stated by the distillery In-charge was that old molasses stock was consumed. At this rate it appears that they never work the fresh molasses and every time the molasses are allowed to become old and then taken for fermentation. In short, there is no control on proper utilisation of the feedstock.

The stoppages of the distillation section are varied and in many cases avoidable. On the day of the visit the distillery was closed down because there was accumulation of the effluent. This was because of the continuous rain in the region, the farmers were not taking the effluent for the irrigation of the crops. Normally they settle the effluent in lagoons and after biodegradation dilute the effluent and utilize it for the irrigation or sugarcane crops. At this rate there appears to be no solution to this problem for the period of the rainy season. Among the other reasons of stoppage were, no steam supply because the sugar factory was closed and there was delay in firing a fresh boiler, no supply of fire wood (fire wood is used for boilers when the sugar factory is closed), fresh water shortage in the month of April and such other reasons.

DISPOSAL OF EFFLUENT

Disposal of effluent causes several stoppages. The effluent is spread in the lagoons for biodegradation and later on diluted 10 times to feed to the sugarcane crops. The retention time of the lagoons is 100 days. The quantity of effluent is 1,10,000 gallons per day. The actual recovery of alcohol per tonne of molasses is between 210 to 214 litres per tonne of molasses. In general it can be said that the distillery is not being run in a business-like manner. There is great scope of improvement in every field of operation.

KOLHAPUR SUGAR MILL DISTILLERY : STORAGE OF MOLASSES

At present the molasses are stored in masonry tanks built under ground and covered with corrugated asbestos cement sheets. The total capacity of storage is 1,000 tonnes while the requirement of molasses is 50,000 tonnes per year. The present storage of 1,10,000 tonnes includes the storage of sugar factory as well as distillery. When asked about the plans for increasing the storage capacity the Manager, Mr. Bensal stated that there were no plans. When asked how the amount of Rs. 4 lakhs being set aside every year as a result of working of the sugar factory it was stated that they may think of utilizing it for storage tanks in course of time. The present storage tanks of Brick masonry were stated to be leak proof and molasses did not get damaged in the present storage. The Management was quite happy with the present storage tanks. However, it is felt that for the size of the sugar mill and the distillery, this storage is inadequate.

FERMENTATION HOUSE

The fermentation house and three fermentors each of 22,000 litres capacity and 18 fermentors varying in capacity is as follows:

13 of 7, 500 litres
2 of 8,100 litres
3 of 37,500 litres
Total 18 Nos. 22,26,200 litres

The initial Brix in the pre-fermentor is kept at 10 and for the final fermentor it is kept at 22-23 which drops down to 9 Brix giving 6.5 to 6.9% of alcohol. The fermentors are provided with circulation pump and heat exchanger for cooling as well as spray of water from outside. A temp. of 37 to 38%C is maintained. There are spray ponds for cooling water. It was reported that in summer the temp. of the vats reaches 40°C and the conversion is affected during the months of April & May. At present they do not have immediate plans for provision of cooling towers or any other means for the cooling of water. It was stated during the rainy season the river water is muddy and thereby affects the cooling system. The fermentation house was unclean, ill-ventilated and congested. There is scope for improvement.

ALCOHOL DISTILLATION

The distillery has two sets of distillation equipment, in one set the diameter of analyser is 72" and in other set the diameter of analyser is 60". The total distillation capacity is 50,000 litres per day and in the last year 84 lakhs litres of alcohol was produced with two months being shut down because the storage tank for alcohol was full. This unit uses alcohol for captive consumption. The factory had trouble in the chemical plant and, therefore, for two months there was no off take of alcohol. The distillation section was satisfactory compared to the distillation sections of other factories. There is a provision to produce absolute alcohol. The management was not in a position to give details about the efficiency of fermentation and distillation inspite of the fact that they were informed about it in the morning and the factory was visited in the late afternoon. However, they have promised to send the data by post later on. It was stated offhand that the molasses contain 50% sugar and the unfermentable portion was 5.6%. The factory has a chemical plant attached. The conversion factors in the chemical plants were stated as follows:—

Acetaldehyde	—	568 litres of 95% alcohol per tonne.
Acetic Acid	—	855 kg. of Acetaldehyde per tonne.
Butanol	—	2,700 litres of alcohol per tonne.

It was stated that the distillery as well as the alcohol-based industry was not treated by the Government as a continuous industry and therefore due to several power stoppages and the weekly cut, the efficiency of both the plants suffered heavily. Alcohol was lost at the time of start up and shut down of the plant whenever electrical power was stopped. The other problem was of cooling water. The distillery do not have a person qualified for the job. Other comments cannot be made because the details are still awaited.

Report of the visits to distilleries of Oudh Sugar Mills Ltd., Hargaon and Hindustan Sugar Mills Ltd., Golagokarannath.

Mr. A. Swaminathan accompanied by Dr. S. K. Somaiya, Dr. K. S. Tiwari, Mr. M. R. G. Menon, Mr. A. D. Patankar and Mr. Bhatia visited the two above mentioned Distilleries on 28th July, 1977

II. GOLAGOKARANNATH DISTILLERY

1. Fermentation House

The distillery prepares its own yeast culture from stock culture preserved by them. There are two yeast seed vessels and 4 yeast culture vessels and 2 wort sterilizers, all made of stainless steel. There are 8 fermentors in mild steel with a total capacity of 1,48,000 litres. There are 17 fermentors of mild steel a total capacity of 22.2 lakh litres. The majority of the fermentors were in the open air. The average fermentation efficiency ranges between 82 & 83. The average percentage of fermentable sugar in molasses is 45% and the percentage of alcohol inwash is 7%. The requirements of molasses of the distilleries is about 1, 2 lakhs tonnes per year of which they receive 80% of the supplies in A grade, 15% in B grade and the remaining in C & D grades.

13—1 M of PC&F/ND/78

2. Distillation Section

All the distillation columns were found to be lagged. They have two sets of distillation equipment in stainless steel. The average distillation efficiency was 93% and the overall efficiency ranges between 74 to 77%.

3. Process Control

This was one of the few distilleries where a very good process control was found. They have a fair size analytical laboratory and samples at various stages are being tested. During the discussions it was found that the Management have interest to improve the working of the distillery.

4. Molasses Storage

The distillery have adequate molasses storage tanks all of which are in mild steel. The production in the distillery has increased two fold from 1964. In the last year completed, the production has been 2.14 crore litres. However the recovery figure is lower than the previous record of the distillery.

5. EFFLUENT CONTROL

The B. O. D. is reduced by lagooning the effluent over a wide area and finally diluting it with water. There was some discussion on effluent treatment and it was suggested that it by using polyelectrolytes, solids are removed by coagulation, the treatment may be easier.

(ii) Hargaon Distillery

(1) Fermentation House.

The temperature control of the fermentors was only by outside spray of water. While discussing the advantages of cooling through heat exchangers, the authorities were convinced that it was a better alternative. The Distillery uses 1/3rd of its own molasses and 2/3rd molasses received from the outside. It was stated that the quality of molasses received from outside has been going down year by year. They have 4 pre-fermentors of total capacity of 47,000 litres and 15 fermentors of total capacity of 15 lakh litres. The range of operation of fermentors was stated to be between 28 to 32°C. The annual requirement of molasses was 5.4 lakh quintals. The average fermentation efficiency has been reported as 83% and average sugar content in molasses is reported as 46.5%.

(2) Distillation Section

They have two sets of distillation units and both the columns were lagged. The distillery is using exhaust steam. Recovered heat is utilised to heat spent wash. The total distillation capacity is 45,000 litres per day.

(3) Storage of Molasses

The Distillery has got 3 tanks in mild steel with its total capacity of 3,700 tonnes and 3 underground covered storage tanks of total capacity of 7,600 tonnes. In addition they have steel storage tanks of 8,400 tonnes capacity and 2 more storage tanks in steel have been proposed.

The distillery has fermentation efficiency of 83% and distillation efficiency 97% and overall efficiency of 80%. The percentage utilisation of distillery capacity is about 55%.

(4) Effluent Disposal

Not much attention has been paid in the treatment of effluent. At present the effluent is treated with lime and diluted 12 to 13 times with water and sent out. The authorities have applied for land to adopt the lagoon biodegradation pattern used in other distilleries. The need for adopting the available treatment methods was emphasised to the management.

THE HINDUSTAN SUGAR MILLS LTD. DISTILLERY GOLAGOKARANNATH (U.P.)

PROPOSED CHANGES AT DISTILLERY DURING CURRENT SHUT DOWN

1. Installation of a water cooling tower to make available adequate quantities of cold water for cooling the wort/wash in fermenters.
2. Adding an additional multi pass condenser to make up shortfall in capacity.
3. Operation of existing dehydration column as an additional rectifier to take advantage of available additional capacity of analyser, at the same time reliving operating back pressure in the plant.
4. Provision of an independent culture laboratory to ensure propagation of yeast under full aseptic conditions.
5. Instrumentation: installation of an automatic brix controller and provision of indicating and integrating meters from wash and alcohol separately for both the plants.

THE HINDUSTAN SUGAR MILLS LTD.

Golagokarannath, Distillery

	1976	1977 up to 30-6-77
1. Average production per day	41434 Litres	58704 Litres
2. % Stoppage Plant I	19.1	26.7
Others	19.6	2.4
Plant II	34.3	40.2
Others	22.7	3.2
3. Fermentation efficiency %	82.7	83.9
4. Distillation efficiency %	91.0	93.0
5. Recovery (100%) Litres/Tonne	2.19	2.29
6. % fermentable sugar in molasses	45.1	46.4
7. % Alcohol in wash	6.9	7.1

Hindustan Sugar Mills, Golagokarnnath — Calculation for 30-6-1977

1. Wash distilled		.. 1281578 litres
2. Sludge in wash		.. 2%
3. Wash charged (1 less 2%)		.. 1255947 litres
4. Wash made		.. 1303184 litres
5. Molasses used		.. 3729.6 quintals
6. Rectified Spirit produced		.. 92250 litres
7. Strength		.. 94.4% v/v
8. Alcohol produced as 100%		.. 87084 litres
9. % of Alcohol in wash distilled by analysis in Lab.		.. 7.2%
10. Brix of molasses		.. 90.0
11. Total reducing sugar in molasses		.. 50.0%
12. Unfer. sugar in molasses		.. 4.0%
13. Fermentable sugar in molasses (11-12)		.. 46.0%
14. Consumption of molasses for 1,000 litres of wash	$\frac{37296. \times 1000}{1303184}$	.. 2.86 quintals

(For calculation purposes the average consumption of molasses is taken at 2.85 qtls. per 1,000 litres of wash)

15. Initial gravity of wash .. 1090

16. Final gravity of wash .. 1033

17. Fermentation House recovery 1281578×7.2 .. 92273 litres

18. Alcohol in wash charged 1255947×7.2 .. 90428 litres

19. Actual % of alcohol recovered in W-house $\frac{87064}{1281578} \times 100$ .. 6.79

20. Actual % of alcohol recovered after deducting sludge $\frac{87084}{1255947} \times 100$ .. 6.93

21. Total loss in distillation (7.2 — 6.93) .. 0.27%

22. Actual recovery of alcohol at 100% $\frac{\text{Item No. 19}}{\text{Item No. 14}} \times 10 \frac{6.79}{2.85}$ .. 23.8 litres/qtl.

Theoritical yield is 64.4 litres 100% of alcohol from one quintal of fermentable sugar. At 46.0% of fermentable sugar in molasses the theoretical yield is

$\frac{64.4 \times 46}{100} = 29.6$ litres/quintal.

23. Overall efficiency $\frac{23.8}{29.6} \times 100$ .. 80.4%

24. Available alcohol (110%) on theoriticables $\frac{87084}{80.4} \times 100$ .. 108313 litres

25. Fermentation efficiency $\frac{92273}{108313} \times 100$ .. 85.2%

26. Distillation efficiency $\frac{87804}{90428} \times 100$ .. 96.3%

THE OUDH SUGAR MILLS LTD. HARGAON (Distillery Department)

Statement Showing Percentage Utilisation of Installed & Licensed Capacity and Percentage of closure due to Various Reasons During the Following Five Years.

Year	Installed Cpacity	Licensed Capacity	Production	% Utilisation of installed	% Utilisation of licensed	Main reasons for declined in production				
						Steam & Molasses Power Shortage % Stoppage		Warehouse full % Stoppage	Fuel	
1	2	3	4	5	6	7	8	9	10	11
1971-72	15.0 Million Qtls.	11.52 Million Qtls.	9758946	63.3	84.7	33.2	16.6	40.72		
1972-73	..	..	5119603	32.3	44.4	..	57.72	34.81	..	..
1973 74	..	..	5949031	37.4	51.6	20.02	..	13.48	..	61.3 Strike
1974-75	..	..	8569021	54.0	74.3	57.69	..	34.65	..	..
1975-76	..	..	8719863	54.8	75.7	52.99	..	43.14	..	..

Measures Adopted to Increase Production :

1. For storing molasses we are very soon starting construction of two new steel covered tanks to avoid dilution of molasses and seepage loss.
2. Two new M.S. fermenters were constructed to avoid loss of wash.
3. Two new Alcohol storage tanks constructed to avoid closure due to warehouse full.
4. Proposal to instal one new Coal fired boiler with stroker.
5. Proposal to instal water softing plant for fermentation and condensers to avoid scale fermation due to hardness of water.

THE OUDH SUGAR MILLS LTD., HARGAON

(Distillery Department)

Year	Molasses	Molasses consumed of the following sugar per cent				Average Sugar	Fermentation efficiency	Distillation efficiency	Overall efficiency
		40% to 50%	47% to 48.9%	44% to 46.9%	Below 40% to 44.9%				
1971-72	430087	115080	190140	124867	..	47.5%	84.3	97.3	81.7
1972-73	224614	118690	85909	..	20015	48.0%	84.3	97.2	81.3
1973-74	268098	35140	101408	30050	1500	47.4%	84.0	97.0	80.6
1974-75	382545	115210	125761	141574	..	47.6%	83.66	97.25	80.8
1975-76	390474	75586	151508	64927	98153	46.5%	83.3	97.25	80.5

KOLHAPUR SUGAR MILLS, KOLHAPUR

Sample working results extracted from the form E

	July 76	Aug. 76	Sept. 76	Oct. 76	Nov. 76	Dec. 76	Jan. 77	Feb. 77	March 77	April 77	May 77
Fermentation Efficiency %	80.09	84.04	83.66	81.76	83.24	81.07	81.53	80.35	80.65	85.3	85.31
Distillation Efficiency %	90.70	95.05	84.62	76.92	90.20	90.18	92.05	85.66	83.32	90.31	95.21
Overall Efficiency %	71.50	78.26	66.72	61.56	72.57	70.92	74.61	68.04	67.05	75.13	78.56

Report on the visit to the National Sugar Institute, Kanpur and the H. B. Technological Institute, Kanpur by Shri A. D. Patankar and Dr. K. S. Tiwari.

The above two institutes were visited on 30th and 31st August, 77 respectively.

National Sugar Institute:—

The scope of work of the National Sugar Institute was explained by Dr. N. A. Ramaiah, Director Dr. L. Viswanathan, Professor of Bio-chemistry. Dr. Ramaiah stated that the institute has two functions viz a teaching function and advisory function. In the teaching function the institute conducts courses for:—

(1) Associateship Course in Sugar Technology.
(2) Associateship Course in Sugar Engineering.
(3) A Diploma Course in Industrial Fermentation and Alcohol Technology,
(4) A Certificate Course in Sugar Engineering.
(5) A Certificate Course in Sugar Boiling,
(6) A Certificate Course in Pre-harvest cane Maturity Survey.
(7) A Certificate Course for Supervisor in Khandasari Sugar Unit.
(8) A Course for Khandasari Artisan.

It was stated that the institute gives advice to the Sugar Factories all over India.

The Institute has a small sugar factory in its premises for training students in sugar technology. It appeared that there was more emphasis on training personnel for sugar technology and sugar engineering, Khandasari Sugar, sugar boiling etc. So far as the distillery industries were concerned the Diploma Course in industrial fermentation and alcohol technology was of interest. This course has a duration of one academic year followed by four months practical training in a distillery. This course was started in 1963 admitting about 6 students. The number of admissions were increased to 27 in 1974. However, they found that the trained candidates could not be absorbed by the industries and the authorities were forced to decrease the number to 12 at present.

When the syllabus for this course was asked for, the authorities did not have a printed or cyclostyled copy. A handwritten copy was made from the notes of the Professor of Bio-chemistry and handed over to us next day. This was rather surprising as about 12 batches must have been completed since 1963. From the details of the syllabus given, it is concluded that the course was not of a good standard, and in the short duration of the course it was not possible to give useful training to the students to take charge of a distillery. Most of the subjects appeared to have been taught only qualitatively and there was hardly any attention paid to details. It is no wonder that the students taking this course, do not find employment in the industry and the number of admissions have been consequently reduced from year to year.

Going through the laboratories of the institute, it was found that the institute does not have much facilities for the course to study industrial fermentation and chemical engineering. The institute may be suitable for sugar technology but in the present state, it is unsuitable for training students for the distillery industry. During the technical discussions with the Director of the Institute, it was learnt that the institute is co-ordinating some work on growing the various varieties of sugar cane, and they are in contact with the institute for sugarcane research at Coimbatore. The institute has an experimental sugar farm. Thus the emphasis is more on the sugar cane and sugar. The Director discussed in great detail the various aspects of research on improvement in the quality of sugarcane. While discussing the fermentation technology, it was stated that the institute maintains cultures for use by the distilleries. They charge Rs. 60 for two tubes of culture. On being asked to state the number

of clients they have who take culture from them, they were not able to state the number. On being asked what were the characteristics of the culture they recommend to the distilleries, it was stated that pH 4.8—5.0, Temperature 28 to 30°C Max. alcohol content using Gr. 1 molasses, 6.0 to 7.5%. On further questioning about the recommended temperature the authorities were not able to explain how this culture can suit the various Indian climates particularly in the Summer. From the information given, it appears that the institute has no liaison with the distillery industry and they do not appear to know the problems of the distillery industry. However, they stated that they do advisory work for the distilleries. They have done some work on utilization of Bagasse and they have developed a process to manufacture a mixture of products, alcohol, Furfural, Xylose, Yeast and Citric Acid. They were not aware of the various other cultures and their specifications. On being asked whether they have studied the performance of yeast marketed by the Indian Yeast Co., they answered in the negative. It was our impression that in the present state, the course offered and facilities available at the sugar institute were not adequate to train suitable candidates for the distillery industry.

H. B. TECHNOLOGICAL INSTITUTE:—

Dr. Pandey, Head of the Department of the Chemical Engineering of H. B. Technological Institute, which is affiliated to Kanpur University, explained the activities of the institute and the facilities available there. The institute is purely an educational institute, conducting courses in the various branches of technology. They have courses leading to the degree in Civil Engineering, Paint Technology, Plastic Technology, Oil Technology, Bio-chemical Engineering etc. The institute is well equipped with the laboratories and equipments for engineering courses as well as technological courses. They have all types of sophisticated equipments and instruments. They have also well equipped laboratory for fermentation technology. They have a small distillery but at present it was not in working condition. It can be easily set-up and brought into operation. The degree course in Bio-chemical Engineering is of the duration of the 3 years.

The H. B. T. Institute and the degree course in Bio-chemical Engineering as it exist today, is quite suitable for training personnel for the distillery industry. In fact the candidates passing out from this institute can be straight a way absorbed in the industry with immediate benefit. The candidate can not only be useful for distillery industry but also for other industries where products are manufactured by fermentation technology. The institute carries out research work in the various fields and they have well qualified staff for all the subjects.

During the technical discussions with Dr. Pandey, the following suggestions were made by him. It was suggested that there should be 4 zonal centres to maintain type cultures and evaluate the performance of various cultures and give assistance to the industry for use of most suitable culture. At these centres work on optimisation of all parameters responsible for efficient fermentation process can be studied. It was stated that there was no clear picture about the suitable type culture, and there is no agency to advise the distilleries to use the most suitable culture. Suitability of the culture depends on percentage conversion, the temperature range (withstanding the climatic conditions available in India) the time cycle for completion of the fermentation process, the final percentage of alcohol reached. After the study of the performance of the culture on all these factors a culture that withstands the optimum conditions can be selected. These zonal centres can have pilot plant for fermentation process for use of the industry. The zonal centres should also have a pilot plant for distillation operation. The zonal centres should have a well equipped analytical laboratory to provide facilities for the industry.

Such a zonal centre can be straight way started at the H. B. T. institute since the institute has got all the facilities. The details of the courses provided by the institutes are given in the Appendix.

It will be observed that the degree cource in Biochemical Engineering at H.B.T. Institute is the most suitable course for the distillery industry.

Minutes of the meeting held on 9-7-1977 at 11 A.M. at New Delhi with the representatives of All India Distillers' Association.

PRESENT:

1. **Representing Alcohol Committee:**
   (a) Shri A. Swaminathan, Chairman
   (b) Dr. K. S. Tiwari, Secretary
   (c) Shri A. D. Patankar

2. **Representing All India Distillers' Association**
   (a) Shri P. K. S. Nair (Sakarwadi)
   (b) Shri K. S. Sharma (Shamli)
   (c) Shri O. P. Bhatia (Catainganj)
   (d) Shri M. R. G. Menon (Gola)
   (e) Shri Shivraj Gupta (Meerut)
   (f) Shri O. N. Chandoke, Secretary, AIDA
   (g) Shri E. K. Jayanarayanan, Mohan Nagar.

At the outset the Chairman stated that the idea is not 'witch-hunting' but to find out facts and suggest improvements in the working of the distilleries so that the production of alcohol can be increased.

1. Referring to the replies to questionnaires, it was stated on behalf of AIDA that telegrams have been sent to distilleries that have not replied so far. It was felt that all replies would be available by the end of July, 77 latest.

2. Referring to the technically qualified staff, it was stated that there is no special training course available for the distillery industry. However, HBTI and NSI are the two institutions who conduct courses in sugar technology and allied processes. Students from these Institutions are absorbed in the distilleries for employment. It was appreciated that if technically qualified people were available, it would be possible to improve efficiency of the distilleries. At present, the technical services area are missing. It was suggested by the Chairman that a group of distilleries can have a technical cell so that they can utilise the services of experts for improvement of the efficiency. It was stated on behalf of AIDA that with the present state of industry, it was not possible to meet the expenditure on technological improvement. The Chairman suggested whether it would be a good idea to recommend to the Government for creation of a development fund by increasing the price of alcohol. The money collected will be funded to AIDA for utilisation for technical studies. One hundred and twenty distilleries can participate as an Association in conducting research and development work for improvement of the working of distilleries. The idea was appreciated by the members and required further thought to the problem.

3. Referring to the technical discussions held by the Association, it was pointed out that periodical meetings are held to discuss the common technical problems. Copies of the minutes of the meetings were presented for information. It was suggested that the Association may submit a summary of such suggestions made by the Technical Committee for information of this Committee. The problems in general faced by the industry were listed as follows:

   (a) Disposal of effluent
   (b) Steam consumption
   (c) Scaling
   (d) Efficiency of fermentation

14—1 M of PG&F/ND/78

The factors responsible were stated as quality of molasses, quality of yeasts, high calcium content in molasses and weather conditions. Under these conditions the shutdown period for cleaning of columns varies from place to place.

4. There was a discussion on some technical aspect of the industry such as possibility of fermentation at high concentration, reduction of loss of alcohol entrained with the evolution of carbondioxide, clarification of molasses prior to fermentation, continuous fermentation. It was emphasised that certain uniform standards should be evolved for working of distilleries and inefficient distilleries may be improved to a uniform standard. In view of higher price of molasses at present, it is worthwhile to look for improvements such as pre-treatment of molasses and other operating conditions.

5. It was observed that the capacities of most of the distilleries range between 10 and 50 Kilo litres per day and the biggest single unit has a capacity of 60 kilo litres per day. Thus our distilleries are medium size and small size units. It may be necessary to have bigger size distilleries to make their working economical.

6. It was stated that adequate increase in price of alcohol has not been given incomparison to increase in prices of coal and other items that has taken place. Due to this reason the present size of distilleries have become uneconomic. Some data for the cost of production of alcohol was asked for. The Chairman handed over a list of points on which the Association may furnish information to the Committee as early as possible.

7. At the end of the meeting, the Chairman summarised the discussion taken place as follows:

(i) Action on questionnairse.

(ii) Action on note submitted at the meeting.

(iii) Summary of technical exchanges in the meetings held by AIDA may be sent.

(iv) There was a feeling that trained graduates do not come to distilleries for employment

(v) Not much improvement has been done in distillation but not more work has been done on fermentation. There appears to be lot of scope of further work in both aspects of the industry.

(vi) A fresh look is required to be taken in various processes such as pretreatment of molasses in view of the increased initial cost.

(vii) For better technical improvement of the distilleries, consideration may be given to a soft loan fund or a cess to be given to Association to finance the research development work.

(viii) The smallest as well as the biggest single distillation unit is between 10 and 50 kilo litres per day capacity.

(ix) Large no. of small units are engaged in production of potable alcohol Units producing industrial alcohol are moderately large though ridiculously small as compared to other industries.

(x) The work of finding alternate sources of alcohol may be referred to CSIR.

REPORT ON KHANDSARI MOLASSES POSITION IN U. P. SUBMITTED BY MR. BHAGWAN DIN

At present there is no control of the State Government on the production and distribution of Khandsari Molasses in Uttar Pradesh. The question of controlling Khandsari Molasses with a view to ensuring its supply to distilleries and industries was discussed by the Excise Commissioner with the Secretary Excise. A scheme was formulated and furnished to Government, which is under their consideration.

There are 4077 Khandsari Units in Uttar Pradesh, of which 1219 are Sulphitation Units and the remaining 2858 are Non-sulphitation Units. Of the 1219 units 312 units are run by hydraulic pressure. Sulphitation Units run by Hydraulic pressure are big units.

These Khandsari Units are spread over a number of districts and most of them are located in the remote corners of the districts where means of communication are not easy. It would, therefore, be not possible to exercise effective control over all the Khandsari Units in the beginning. Under the Scheme chalked out by the Excise Department, it is proposed to control only 312 Hydraulic Pressure Sulphitation Units, which are big ones, in the beginning.

There is no reliable data available regarding production of molasses by Khandsari Units. However, it is estimated that about 12 lakh quintals of molasses, only 5 lakh quintal molasses will be available if the aforesaid 312 Hydraulic Pressure Sulphitation Units are controlled.

There is no provision under the U.P. Molasses Control Act, 1964 to control Khandsari Molasses, the U. P. Molasses Control Act will have to be suitably amended. It is proposed to amend the Act accordingly.

Additional Excise Staff will also be required for the supervision over the Khandsari Units. In the Scheme, proposal for the sanction of additional excise staff has also been made

WEST BENGAL ALCOHOL BASED INDUSTRIES ASSOCIATION

B. B. Minto Park,
13, D. L. Khan Road,
Calcutta-700 027.
Dated : 1-7-1977.

MEMORANDUM SUBMITTED TO THE SWAMINATHAN COMMITTEE BY THE ALCOHOL BASED INDUSTRIES IN WEST BENGAL

We are indeed most grateful to you, Chairman, Sir, and the distinguished members of your Committee for granting us the privilege and opportunity of meeting you this evening and placing before you various problems experienced by Alcohol-Based Industries in West Bengal for your kind consideration and remedial actions.

Over the years, a number of alcohol-based industries have grown up in West Bengal manufacturing articles like Lif. Saving Drugs, essential detergents, foils for medicinal packaging, Shellac commanding a high export market and Low Density Polyethylene on which a vast number of small scale units largely depend. Indeed, the manufacture of polyethylene and other vital industries in West Bengal now consume together around 50 million litres of alcohol annually.

West Bengal, though a large consumer of alcohol, hardly produce any with its own resources of sugarcane and molasses, therefore, virtually dependent on supplies from the neighbouring State. Uttar Pradesh, in particular.

It may appear somewhat illogical to set up so many vital alcohol-based industries in a State having no alcohol of its own but if we go back to the earlier history when the sugar factories had no outlet for their bye-product molasses used to be thrown away from their factories on payment to the contractors and the alcohol-based industries were in infancy. Whereas West Bengal had a very large outlet for products based on alcohol and it was, therefore, perhaps prudent on the part of the manufacturers to set up their units of Alcohol-based industries around Calcutta, the largest port city with highly developed communication system within the country for Inter-State movement. And in the early years of post independence, plan for developments of many alcohol-based industries in the country was not envisaged—Polythene Plant in West Bengal set up in 1958 and inaugurated by the present Prime Minister and the then Finance Minister, Mr. Morarji Desai, was the first large scale alcohol based industry in the country. Therefore, in the process of diversion of alcohol for industrial usage, the alcohol-based industries have grown in West Bengal and are now deep-rooted and playing a vital role to country's economy. These units are going to stay not only on commercial grounds but mainly on humane considerations. Similar industries may be set up and developed in alcohol producing areas but the already existing industries in West Bengal cannot be closed for lack of alcohol production and availability in West Bengal, for hundred thousands of people engaged in the present operation could not be thrown out of their jobs, homes and hearth, even if similar products could be manufactured and cater for the needs of the country in places having regular potential of alcohol supplies. Therefore, the alcohol-based industries in West Bengal plead before your august committee, Mr. Chairman, Sir, to consider seriously the problems of West Bengal alcohol-based industries and recommend ways and means for the survival of the existing alcohol-based units to safeguard the destiny of thousands of people fully dependent thereon.

The alcohol producing States particularly, Uttar Pradesh, have been all along very sympathetic and considerate to the needs of West Bengal industries and if we may say so, we owe Uttar Pradesh Government deep gratitude for continuity of our operations in West Bengal but for their generous assistance, the wheels of the alcohol-based industries in West Bengal would have come to a grinding hault long ago. We are confident that we will be

able to enjoy the favour and generosity of Uttar Pradesh Government always as hitherto and we are also beholden to the other alcohol producing States for lending their helping hands in lean years of alcohol production.

Movement facilities are very important for alcohol-based industries and, therefore, rational distribution of supplies from different States will help eliminate unavoidable expenses towards freight and ensure uninterrupted operation. Experience in the past in many a year revealed almost 'Nil' stocks with the of alcohol, therefore, need hold inventories to over atleast 3 months production. Experience in the past in many a year revealed almost 'Nil' stocks with the industries in West Bengal at the end of the alcohol season which often tend to cause apprehension of closure or slow-down in production. Therefore, it is also important that the consumers in West Bengal are allowed to maintain a stock cover for minimum 3 months production at the close of the alcohol year.

The alcohol-based industries not only in West Bengal but through out the country are very much affected by the multifarious levies imposed by the various State Governments. Even the pharmaceutical industries using rectified spirit are levied payment of export pass fee as high as 175 paise per litre in some States as is levied on rectified spirit for conversion into potable liquor. The pharmaceutical industries are deprived of the preferential excise levies, as because they draw the supplies in the form of rectified spirit. Spirit required for Pharmaceutical industries cannot by denatured, for denaturants will interfere with the process and be detrimental to pharmaceutical preparations. We, however, understand the High Powered Levy Committee have since concluded their deliberations and recommended for a uniform levy on industrial alcohol irrespective in the form of rectified and denatured spirits just to cover the bare administrative charges of the Excise Department of various States. We look forward anxiously to the implementation of the recommendations of the Levy Committee before long.

Chairman, Sir, we once again thank you for kindly accepting our invitation and meeting us here this evening and we will look forward to your serious consideration for the survival of the alcohol-based industries in West Bengal.

Sd/-

(A. B. Roychowdhury)

Secretary

QUESTIONNAIRE FOR PRODUCERS OF ALCOHOL

I. STATISTICS OF PRODUCTION

What is the location of your distillery? Is it connected by rail/road if so by B. G. or M. G. Railway system.

(1) What are the different varieties of alcohol manufactured by your firm, rectified spirit, denatured spirit, potable spirits?

(2) What is your present installed plant capacity for the manufacture of different varieties of alcohol? Please give both the daily and annual capacity. What was the storage capacity for molasses and alcohol?

(3) What was your actual production, of each variety of alcohol for the last three years?

(4) What is the average number of working days in a year during which your plant is in operation?

(5) If production at rated capacity is not achieved—reasons for shortfall in production.

(6) Consumption norms.

II. RAW MATERIAL SUPPLIES

(1) What is the raw materials/materials used for the manufacture of alcohol at your works?

(2) Where from do you obtain your supplies of raw materials? If you obtain supplies from more than one source, indicate the quantity obtained from each and the distance from each source and mode of transport.

(3) What is the average price paid by you, delivered at your works, for these raw materials?

If transport of the raw materials involves haulage over considerable distances, from the sources of supply to your works, please specify the method of transport—by rail by motor lorries, etc., and also mention the transport charges. Please state the average transport charges, per tonne of raw material during the last three years.

(4) Are the raw material supplies to you of a uniform quality throughout the year; or, are there any seasonal or other fluctuations in the quality?

(5) What is the type of storage provided for the raw materials at your works, and what is the total storage capacity available?

(6) Have you any specific difficulties in regard to your raw material requirements?

(7) Besides the principal raw materials, such as molasses, mahua flowers, etc. what are your arrangements for obtaining other materials, such as yeast and benzene?

III. PLANT AND PROCESS

(1) Please give a brief description of the type and size of the various plant units, and details of the process employed at your works.

(2) When was your plant installed and when did you start production? If it has not been operating at or near its full rated capacity for any considerable length of time, from the date of its installation until now, please indicate the reasons.

(3) Did you have any occasion in the past to replace any substantial part of your original plant or equipment or is there any need for such a replacement either now or in the near future? You may please mention the reasons for such replacements.

IV. ALCOHOL SALES

(1) Industry-wise, who are your major customers, i.e. whose aggregate off take accounts for more than 85% of your total production? The proportion of your total production sold to each of the following industries may be mentioned separately:

(a) Potable purposes.

(b) Pharmaceuticals concerns.

(c) Other industries.

(d) Denatured spirit for domestic use.

(2) What is your ex-works selling price for each variety of alcohol manufactured by you?

If the selling price for part-or-whole of your production is controlled, as in the case of industrial alcohol, what is the price which you actually realise on such controlled sales? And for the same product what is the price which you realise from sales on which no such control is imposed?

(3) What is the approximate percentage of each variety of your alcohol production sold within the State in which your distillery is located and what are the other States to which you export substantial quantities of alcohol?

(4) What are the respective percentages of the quantities transported by you:

(a) in tank wagons by rail.

(b) in tank cars by motor lorry.

(c) in smaller packing like 200 litres and 25 litres drums to your various customers?

(5) Do you have any serious transport difficulties, such as inadequate tank wagons facilities etc?

(6) Is the demand for your products evenly spread over the whole year; or are there any seasonal variations?

V. EXCISE POLICY AND CONTROL

(1) What is the storage capacity of your bonded warehouse or warehouses.

VI. GENERAL INFORMATION ABOUT THE COMPANY

(1) Is your firm registered under the Companies Act? Is it a public limited company, private limited company or a partnership? Is your company also registered under the Industries (Development and Regulation) Act?

(2) Have you any expansion schemes to increase the production capacity of your plant? Are you sources of raw material supplies and other resources adequate to take up scheme for expanding your production substantially if there is sufficient demand for increased production of alcohol? Please indicate the maximum extent to which it will be possible for you to undertake increased production of alcohol at your works.

(3) In addition to the above information, you are requested to mention any other problems relating to your industry to which you wish to draw the specific attention of the Government with a view to initiate whatever action may be necessary to ensure a proper and rapid development of the alcohol industry in this country.

Note : Whenever word 'year' occurs in this questionnaire, the reference is to the financial year 1st April to 31st March.

QUESTIONNAIRE FOR USERS OF ALCOHOL

1. What are the various products for the manufacture of which you require alcohol at your works?

   Please mention the plant capacities for each of those products and also the annual production for the last three years.

2. Do you have adequate storage capacity both alcohol & finished products, rectified spirit or denatured spirit for your works? What was your annual alcohol consumption for the last three years? What is the anticipated demand for alcohol at your works during the next 5 years? If the latter figure is substantially more than your present consumption of alcohol, please indicate the reasons for the demand anticipated for the next five years.

3. If denatured spirit is required for your purposes, is there any need for the use of special denaturents such as Crotonaldehyde/acetaldehyde or the usual denaturants like pyridine will suffice?

4. What is the average price, delivered at your works, for alcohol supplied during the last three years, indicating details of excise levies, taxes etc. if any, separately.

5. What is the incidence of the cost of alcohol on the cost of production of each of your products in the manufacture of which alcohol is used.

6. What is the percentage of your total production sold in the State in which products are exported in substantial quantities.

7. Do you get alcohol duty free? If duty or any other fee is paid please indicate the incidence of the duty of such fee on the total cost of each product in the manufacture of which alcohol is used.

8. Have you any plans for expansion of your production capacity?

   If there any such plans what will be your additional demand for alcohol?

   Is the position regarding plans for further expansion dependent, to any extent, on the availability of alcohol at a cheaper price and or any other measures relating to alcohol supplies?

9. When did your factory start production: If production at any particular period was much less than the rated capacity, please indicate the reasons.

10. What is the total number of persons employed currently in your factory in the various categories of skilled, unskilled and supervisory staff? Indirect employment provided through your products.

11. In addition to the above information, you are requested to mention any other issues to which you wish to draw the specific attention of the Government with a view to expanding the scope for the manufacture and utilisation of industrial alcohol in this country.

Note: Wherever the word 'year' occurs in this questionnaire the reference is to the alcohol year from 1st December to 30th November.

QUESTIONNAIRE FOR PRODUCERS OF MOLASSES

1. Please give the year wise production of sugar at your factory during the last 5 years (year-wise).

2. Please give the projected plans of expansion of your unit during the next 5 years stating the year in which your expansion programme will materialise if already approved by the Government.

3. Please give the year-wise production of Molasses of your factory during the last 5 sugar years.

4. Please give the estimates of production of Molasses during the next 5 years year-wise after expansion and stating the year in which the production will materialize.

QUESTIONNAIRE FOR DIRECTORS OF INDUSTRIES/ EXCISE COMMISSIONER OF STATE GOVERNMENT.

1. What is the total annual production in your State, during each of the last two years, of

   (a) Absolute alcohol

   (b) Rectified Spirit

   (c) Denatured Spirit

2. What is the present demand in your State for:

   (a) Absolute alcohol

   (b) Rectified Spirit

   (c) Denatured Spirit

3. What are the various alcohol consuming industries in your State? Please supply the following particulars for such of the items for the manufacture of which alcohol is used.

   (i) Installed capacity for the production of each item.

   (ii) Actual production during each of the last three years.

   (iii) Total quantity of alcohol used during each of the last three years.

   (iv) Anticipated demand for alcohol for the next two years.

   If different types of alcohol, absolute alcohol, rectified spirit, denatured spirit are required, please indicate the quantities of each variety separately.

4. Are there any difficulties experienced by the alcohol consuming industries in your State, regarding:

   (i) Alcohol supplies (transport difficulties, high prices etc.)

   (ii) Statutory restrictions such as excise rules and regulations, sales acts, etc. regarding supplies of alcohol and other raw material requirements as also distributions and sales of their finished products.

5. What are the raw materials used by the various distilleries in your State for the manufacture of alcohol? The nature and source of supply of the raw materials used by each distillery may be indicated. The approximate total annual requirements of such raw materials of all the existing distilleries in your State at the present time may be specified. An estimate of the availability of alcohol, either in the existing distilleries, or in the new distilleries to come up in your State may also be indicated.

6. Are the raw material resources and other facilities in your State adequate to start up the production of alcohol, either by expanding the existing distilleries or by setting up new distilleries? What is the maximum possible increase in annual production of alcohol with the available facilities.

7. What is the scope for expanding the production capacity of the existing alcohol consuming industries in your State?

8. In addition to the above information, you may also mention any other factor which in your opinion, will facilitate rapid and rational developments of your alcohol producing and consuming industries.

Note: Wherever the word 'year' occurs in this questionnaire reference is to the financial year—1st April to 31st March.

15—1 M of PC & F/ND/78

QUESTIONNAIRE FOR EXCISE COMMISSIONERS OF STATE GOVT'S

1. Please supply a complete list of all the distilleries in your State with their full names and addresses, and their daily production capacity. Production of each particular grade of alcohol, absolute alcohol, rectified spirit, denatured spirit, potable spirit, at each of these distilleries, for the last three years, may given in bulk litres.

2. What is the total quantity of alcohol of each variety, i.e. absolute alcohol, rectified spirit, denatured spirit, potable spirit, consumed in your State during the last three years?

3. Is the entire production or the major part of alcohol manufactured in your State, utilised within the State? If so, indicate the purposes for which it is used.

4. Are there any industries in your State which are granted exemption from the payment of duty for alcohol? What is the proportion of alcohol supplies to such industries expressed as a percentage of the total alcohol production in your State?

Note : Wherever the word 'year' occurs in the questionnaire the reference is to the financial year (1st April to 31st March).

ALL INDIA ALCOHOL-BASED INDUSTRIES DEVELOPMENT ASSOCIATION

A NOTE ON PROBLEMS OF ALCOHOL-BASED INDUSTRIES

Industrial Alcohol is a starting point for diverse chemical industries.

(A) VERSATILE RAW MATERIAL.

It is a basic and versatile raw material. A variety of consumer goods, organic chemicals, and other products are made from alcohol which in many other countries are made from Naphtha. The superiority of this raw material as a feedstock compared to Naphtha—for a country like ours—rests on three grounds:

(i) Alcohol is derived from a bye-product of an ever-expanding agro based industry and is therefore cheap,

(ii) Alcohol involves no foreign exchange, and

(iii) Alcohol is ever-replenishing and therefore, unlike Naphtha inexhaustible.

(B) PROJECTIONS OF THE IMMEDIATE FUTURES

The sugar industry in our country is poised for rapid growth. While the sugar production in the country at present ranges from 4.5 to 5 million tonnes, during the next decade it is expected that it may reach the target of 7 million tonnes. Even if we base our estimates on production of 6 million tonnes, and even if we leave a side Khandsari molasses, the availability of molasses to the distilleries in the country would be the order of 2.5 million tonnes. Allowing 10% for other uses, wastage etc. the molasses available for production would be about 2.25 million tonnes giving a production of 500 million litres, against the current estimated output of a little over 400 million litres.

In view of the above projections, it is essential to have a long-term and stable policy for prudent utilisation of alcohol.

It is equally important to maintain the viability of this important raw material as a feedstock and therefore to keep it reasonably free from numerous taxes.

(C) BASIC PROBLEM

The basic need of the alcohol-based industries is

(a) adequate and

(b) timely availability of alcohol

(c) without the burden of taxes and at a fair price.

If one surveys the national scene in the country in the sphere of alcohol-based industries, one would immediately observe that alcohol-based industries have done reasonably well, whenever the State Government have followed a progressive policy making adequate alcohol available to the alcohol-based industries in time and without any burden of levies. However, in States, where adequate alcohol has not been allocated whenever required or allocations have been low and halting or very heavy state duties and levies have been imposed, the industries have languished.

(D) INDUSTRIES LEFT IN THE LURCH

When the chemical industries are set up, it is assured that the molasses or alcohol would be made available. After setting up the plants the picture changes. The State authorities in charge divert alcohol for potable consumption obviously on account of revenue considerations. This is often done in disregard to the requirement of the chemical industries. These incidents have happened and are happening in different States in varying degrees.

(E) HUGE PROFITS—A MYTH

There appears to be misplaced notion that alcohol-based industries are making huge profits and therefore can bear increased alcohol prices or heavy levies. This is far from true.

It would appear that this erroneous impression has lingered because of good results of the old established units like "Union Carbide" or "ALKALI-ICI". It is often forgotten that these two units have a variety of products apart from those made out of alcohol and that these units were set up several years ago.

(F) MAJOR UNITS—ALL STRUGGLING

Let us take the comparatively recently established large-scale alcohol based units.

(1) Synthetics & Chemicals—Bareillly (U.P.)

(2) Sirsilk Limited. Kagaznagar (A.P.)

(3) Somaiya Organics—Barabanki (U.P.)

(4) Hindustan Polymers—Vizag (A.P.)

(5) Mysore Sugar (Alcohol Plant)—Mandya (Karnataka)

(6) Acetic Acid Plant of A.P.I.D.C.—A.P.I.D.C., Hyderabad (A.P.)

Each one of the above units has been struggling for long time to find their feet. Now, this is surely not on account of lack of required managerial skill professional expertise. Whatever other reasons, in each case, adequate or timely availability of the raw material and or at a fair cost has been the common problem. Surely such raw material if burdened with high raw material prices of levies or taxes—would worsen the condition of the units, not improve the same.

(G) ESSENTIAL TO REDUCE MOLASSES PRICE

The main trouble is not the Alcohol price but molasses price. In the end of 1975, Government of India, for some inexplicable reason, suddenly increased the price of molasses from Rs. 10/- per tonne to an unexpectedly high figure of Rs. 60/- per tonne—a six hundred per cent rise ! Even the sugar industry which got the rise was surprised. In fact, the sugar industry had asked for a rise from Rs. 10/- per tonne to Rs. 20/- per tonne.

This rise to Rs. 60/- does not do good to anyone; on the other hand, it has done considerable damage. The sugar industry does not stand to gain anything from it, because the realisation therefrom is adjusted in the computation of the levy price of sugar. On the other hand, it has unreasonably jacked up the price of ALCOHOL which the various chemical industries are finding extremely difficult to absorb.

If we have to keep our chemicals at a reasonable price level, then there is no escaping the fact that the molasses price has to be slashed.

(H) NEED FOR UNIFORMITY IN LEVIES AND IMPLEMENTING JALAN COMMITTEE REPORT

There is such a multiplicity and variety of levies on industrial alcohol in different States that it is very difficult to even keep track of all kinds of levies or imports on this important raw material.

These levies assume different forms in different States but they have one common feature in that they uniformly increase the burden on the users of alcohol. These levies taken different forms, viz. : State excise duty gallonage fee, vend fee, permit fee, pass fee, transport fee, entry fee, Special fee, administrative charges etc. besides the usual sales tax, octroi or local panchayat levies. In one—State, there is also a purchase tax.

It need hardly to be mentioned that there is no other commodity in the country which is subjected to such a wide and complex variety of levies. If would be apparent that the same is bound to have a far reaching and serious effect on the cost of end-products.

The Jalan Committee which appointed to study this vexed question has made valuable recommendations. This Committee is reported to have recommended as under:—

> "—in order to bring about some uniformity in the structure of levy in various States, the Committee would recommend that States may impose *a single uniform levy/fee,* by whatever name it is called, on alcohol used for industrial purposes, denatured or otherwise. Needless to add that such levy should be at *reasonable level*".

It is high time that steps are taken for implementation of the above recommendation, without which the progress of the alcohol based industries would be halting.

(I) NO EXPORT OF ALCOHOL TILL INDIGENOUS REQUIREMENTS FULLY MEET

Swings in sugar production or cycles of surplus and shortage virtually lead to swings in alcohol production and its available to indigenous-industry.

It has been the general experience that whenever exports of alcohol have been permitted, we were faced immediately thereafter by a period of shortage and had to import alcohol from abroad for meeting the domestic needs.

Till the full requirements of all alcohol-based industries are met, no thought be given to exports.

(J) POSITIVE INCENTIVES FOR GROWTH OF ALCOHOL-BASED INDUSTRIES

(i) Positive incentives be provided for the growth and development of alcohol-based industries in the country.

(ii) Concepts regarding scale of operation are fast changing. All existing units be permitted to expand suitably to achieve economy of scale.

(iii) There is thinking in some quarters in some States that new alcohol-based industries should be set up only in a co-operative sector. Without raising any ideological issues, it may be mentioned that ours is a mixed economy and therefore there ought to be a scope for all the sectors to exist simultaneously—whether it is joint stock, co-operative, joint, or public sector. In any case, the normal growth and development of existing units should not be choked, as all the units that are existing are national assets, whatever the sector they belong to.

CONCLUSION

The task before the Swaminathan Committee is at once challenging and fascinating.

After the Nagraj Rao Committee made its first study in 1956, the alcohol-based industries initially took rapid strides but slowed down later. The covetous eyes of the exchequer and the way wardness in supplies played with its fortunes. As a result, at times rushing and gushing and often halting and limping, the industry has been plodding its weary way jostling against many odds.

It is our earnest and fervent hope that this new Swaminathan Committee will clear the way of the many thorns, shrubs and thicket which have really become hurdles so that the alcohol-based industries can look forward to a new down of hope cheer leading to a bright and prosperous future.

ANNEXURE—1

All India Alcohol Baaed Industries Development Association (AABIDA) Statewise Estimates of Alcohol Requirements for Industrial Use (Figures in lakhs litres)

	AIDA 75-76				AABIDA 76-77				ESTIMATES 78-79				ESTIMATES 80-81			
	Major	Medium	Minor	Total	Major	Medium	Minor	Total	Major	Medium	Minor	Total	Major	Medium	Minor	Total
1. Andhra	158.00	..	..	158.00	198.00	..	..	198.00	224.00	..	..	224.00	271.25	..	..	271.25
2. Delhi	18.00	..	..	18.00	18.00	..	..	18.00	19.80	..	..	19.80	22.50	..	..	22.50
3. Gujarat	118.80	23.20	..	142.00	124.30	23.20	..	147.50	130.08	25.53	..	155.61	170.50	29.05	..	199.55
4. Haryana	..	1.70	..	1.70	..	1.70	..	1 70	..	1.87	..	1.87	..	2.15	..	2.15
5. Karnataka	63.00	..	..	63.00	63.00	..	..	63 00	63.00	..	..	63.00	80.00	..	..	80.00
6. Kerala	..	13.50	0.02	13.52	..	13.50	0.02	13 52	..	14.85	0.02	14.87	..	16.90	0.03	16.93
7. Maharashtra	677.00	28.13	5.04	710.17	690.00	28 13	5.04	723.17	738.17	30.94	5.57	775.01	898.50	35.07	6.43	940.00
8. Tamil Nadu	140.00	..	0.60	140.00	140.00	..	0.60	140 00	180.00	..	0.66	180.66	250.00	..	0.75	250.75
9. U. P.	930.00	..	..	930.00	995.00	..	..	995 00	1072.00	..	..	1072.00	1250.00	..	..	1250.00
10. West Bengal	360.00	14.80	1.34	376.14	360.00	14.80	2.00	376.80	360.00	15.58	2.05	377.63	450.00	18.53	2.50	471.03
Total	2464.80	81.33	7.00	2553.13	2588.30	81.33	7.66	2677.29	2757.38	88.77	8.30	2884.45	3392.75	101.70	9.71	3504.16

N.B. : (a) This estimate does not include new licences under implementation.

(b) The users have been categorised as under :-

Major.....above 10 lakhs litres per annum.
Medium.....between 1 lakh & 10 lakhs litres per annum.
Minor.....below 1 lakh litres per annum.

(c) This information has been collected wherever possible on the basis of the replies to the Questionnaire of the Swaminathan Committee and elsewhere on the basis of the estimates of 10% expansion in 78/79 and 25% expansion by 80/81 in capacity of existing industries.

(d) In the absence of data from Govt. Depts., the list circulated by Fermentation Panel (originally prepared by AIDA-DGTD in 75/76) has been taken as a "base" however, same is not exhaustive, as many medium/small users of alcohol in different States are not included (e.g. I.D.P.L. & Warner in Andhra etc.).

Estimated Demand

of existing industries by 1980/81—3504.16 lakh bulk litres or 350.41 million litres.

Estimated Consumption of Industrial Alcohol in Lakh Litres

(A) (Major — Consuming more than 10 lakh litres annually)

	AIDA 75/76	AABIDA 76/77	EST. 78/79	EST. 80/81
Andhra				
1. Sirsilk	63.00	36.00	82.50	100.00
2. Tanuku	40.00	40.00	44.00	50.00
3. A.P.I.D.C.	25.00	25.00	27.50	31.25
4. H. Polymers	30.00	70.00	70.00	90.00
	158.00	198.00	224.00	2271.25
Delhi				
1. Hind. Insecticides	18.00	18.00	19.80	22.50
	18.00	18.00	19.80	22.50
Gujarat				
1. Gujchem	60.00	65.00	65.00	95.00
2. Cellulose	36.00	36.50	40.00	47.00
3. Alembic	12.00	12.00	13.20	15.00
4. Atul Chemical, Vapi	10.80	10.80	11.88	13.50
	118.80	124.30	130.08	178.50
Maharashtra				
1. U. Carbide	275.00	275.00	302.50	345.00
2. Kolhapur	110.00	110.00	121.00	138.00
3. S.O.C.	72.00	85.00	95.00	140.00
4. I.O.C.	190.00	190.00	190.00	238.00
5. Polychem	30.00	30.00	30.00	37.50
	677.00	690.00	738.50	898.50
Tamil Nadu				
1. Chemplast	140.00	140.00	180.00	250.00
	140.00	140.00	180.00	250.00
U.P.				
1. Synthetics	770.00	140.00	847.00	960.00
2. S.O.I.L.	160.00	225.00	225.00	290.00
	930.00	995.00	1072.00	1250 00
West Bengal				
1. Alkali	360.00	360.00	360.00	450.00
	360.00	360.00	360.00	450.00
Karnataka				
1. Mysore Sugar	45.00	45.00	45.00	57.00
2. Aruna Chemicals	18.00	18.00	18.00	23.00
	63.00	63.00	63.00	80.00
Total	2464.80	2588.30	2787.38	3392.75

Estimated Consumption of Industrial Alcohol in Lakh Litres

(B) (Medium — Using more than one lakh but below 10 lakhs annually)

	AIDA 75/76	AABDIA 76/77	EST. 78/79	EST. 80/81
Gujarat				
1. Suhrid Geigy	1.80	1.80	1.98	2.25
2. Atul Products, Atul	1.50	1.50	1.65	1.90
3. ATTIC	2.40	2.40	1.65	3.00
4. Cyanamid	7.00	7.00	7.70	8.75
5. Sarabhai, Baroda	3.00	3.00	3.30	3.75
6. Sarabhai M. Chemicals, Baroda	7.50	7.50	8.25	9.40
	23.20	23.20	25.53	29.05
Haryana				
1. Gurewell, Faridabad	1.70	1.70	1.87	2.15
	1.70	1.70	1.87	2.15
Kerala				
1. Hind. Insecticides	7.50	7.50	8.25	9.40
2. Trav. Cochin Udyogmandal	6.00	6.00	6.60	7.50
	13.50	13.50	14.85	16.90
Maharashtra				
1. J.K. Chemicals	5.00	5.00	5.50	6.25
2. HICO	6.00	6.00	6.60	7.50
3. Glaxo	5.29	5.29	5.83	6.50
4. Arlabs	2.50	2.50	2.75	3.12
5. Amar Dye	3.00	3.00	3.30	3.75
6. Zandu	1.87	1.87	2.05	2.33
7. Merck Sharp	1.42	1.42	1.56	1.80
8. I.D.I.	1.80	1.80	1.98	2.25
9. Bombay Drug House	1.25	1.25	1.37	1.57
	28.13	28.13	30.94	35.07
West Bengal				
1. East Anglia	2.80	2.80	3.08	3.50
2. Bengal Chemicals	3.50	3.50	3.85	4.40
3. Angelo Bros.	17.00	7.00	7.00	8.75
4. Aceto Chemicals	1.50	1.50	1.65	1.88
	14.80	14.80	15.58	18.53
Total	81.33	81.33	88.77	101.70

ANNEXURE—4

Estimated Consumption of Industrial Alcohol
(In lakh Litres)

(C) Minor — Using less than one lakh litres annually

	AIDA 75/76	AABIDA 76/77	EST. 78/79	EST. 80/81
Kerala				
1. Travancore Rayons	0.02	0.02	0.02	0.03
	0.02	0.02	0.02	0.03
Maharashtra				
1. Bayer	0.60	0.60	0.66	0.75
2. Industrial Perfumes	0.05	0.05	0.08	0.08
3. Excel	0.20	0.20	0.22	0.25
4. Hoechst	0.12	0.12	0.13	0.15
5. Lakme	0.15	0.15	0.17	0.20
6. Surfactant	0.18	0.18	0.20	0.25
7. Hind Antibiotics	0.65	0.65	0.72	0.80
8. Roche	0.14	0.14	0.16	0.18
9. Parke-Davis	0.83	0.83	0.91	1.05
10. CIPLA	0.01	0.01	0.01	0.02
11. Pfizer	0.96	0.96	1.06	1.22
12. Tata	0.60	0.60	0.66	0.75
13. Therapeutic	0.03	0.03	0.03	0.04
14. Indo-Pharma	0.18	0.18	0.20	0.25
15. Uni-UCB	0.33	0.33	0.37	0.42
16. National Rayon	00.1	0.01	0.01	0.02
	5.04	5.04	5.57	6.43
Tamil Nadu				
1. Mettur	0.60	0.60	0.66	0.75
	0.60	0.60	0.66	0.75
West Bengal				
1. Calcutta Chemicals	0.50	0.50	0.55	0.62
2. Standard Pharma	0.84	1.50	1.50	1.88
	1.34	2.00	2.05	2.50
Total	7.00	7.66	8.30	9.71

16—1 M of PC&F/ND/78

ANNEXURE—5

Comparative Statement of Estimated Requirements of Alcohol by 1981

(In lakh litres)

Sl. No.	Name	DGTD Estimates for 1975-76	Fermentation Panel Estimates 1981	AABIDA Estimates (1980-81)
1.	Synthetic Rubber	530.00	770.00	960.00
2.	Plastic Group			
	P.V.C.	160.00	400.00	250.00
	L.D.P.	350.00	880.00	450.00
3.	Organic Chemicals			
	(i) Acetic Acid (incl ding Acetate Rayon Yarn)	610.00		
	(ii) Butanol	150.00		
	(iii) Butyl Acetate	180.00		
	(iv) Cellulose Acetate	80.00		
	(v) Styrene	130.00		
		1150.00	750.00	
4.	Pesticides or D.D.T.	96.00	60.00	Items (3-4-5)
5.	Pharmaceuticals	300.00	160.00	1740.00
		2526.00	2940.00	3400.00
6.	Paints and Varnishes (French Polish)	100.00	400.00	400.00
7.	Hospitals	—	400.00	400.00
8.	Miscellaneous	100.00	900.00	1000.00
		2726.00	4640.00	5200.00
	Provision for new licences already issued for industrial use	—	—	740.00
		2726.00	4640.00	5940.00
	Non-Industrial Potable use	—	1800.00	1800.00
	Total		6440.00	7740.00

Consolidated Statement showing requirement of Alcohol newly licensed capacities

Sl. No.	Nome	State	Chemicals licensed	Alcohal required in lakh liters
1.	Sudarshan, Poona	Maharashtra	600 MT Acetic Anhydride	6.00
2.	Industrial Promotion & investment Corporation	Orissa	3300 MT A/Acid	35 00
3	U. P. State Industrial Investment Corporation Ltd.	U.P.	6000 MT Acetone	162 00
4.	J.K.K. Acids Ltd.	Tamil Nadu	4500 MT A/Acid	45 00
5.	Arcot Chemicals	Tamil Nadu	5000 MT A/Acid 3000 Ethyl Acetate 3000 Butyl Acetate	
6.	Trichi Distillery	Tamil Nadu	7000 MT Acetaldehyde 2500 MT A/Acid 600 MT Ethyl Acetate 2200 MT Acetic Annydride	210.00
7.	HOC, Rasayani	Maharashtra	5500 MT Acetaldehyde 3000 MT A/Acid 2000 MT Acetic Anhydride	93.00
8.	IDPL	Bihar	4500 MT A/Acid	70.00
9.	T.N. Industrial Development Corporation	Tamil Nadu	1600 MT A/Acid	25.00
			Total	735.00

ANNEXURE—7

Extract from Financial Express, Saturday, December 18, 1976

	Total Estimated availability of Alcohol during 74-75 (Production plus carry over) (in lakh litres)	Proposed Distribution in 1974-75				
		Industrial	Potable	Misc.	Total	Minus Plus or
1. Andhra	310.0	310.0	200.0	115.0	625.0	—315.0
2. Assam	6.7	—	17.5	—	17.5	—10.8
3. Bihar	170.0	10.0	120.0	—	130.0	+ 40.0
4. Goa/Div Daman	0.0			4.0	4.0	— 4.0
5. Gujarat	106.0	200.0	—	—	200.0	— 94.0
6. Haryana	91.0	10.0	46.0	4.0	60.0	+ 31.0
7. Kerala	20.0	35.0	31.5	1.5	68.0	— 48.0
8. M.P. (includes Mohwa)	74.0	21.0	80.0	—	101.0	— 27.0
9. Maharashtra	899.0	551.0	200.0	75.0	826.0	+ 73.0
10. Karnataka	220.0	252.0	32.0	11.0	295.0	— 75.0
11. Orissa	16.0	3.0	6.0	3.0	12.0	+ 4.0
12. Punjab	52.0	—	74.0	3.0	77.0	— 25.0
13. Rajasthan	15.0		83.0	11.6	94.6	— 79.6
14. Tamil Nadu	478.0	260.0	50.0	20.0	330.0	+148.0
15. U.P.	1207.0	585.0	300.0	50.0	935.0	+272.0
16. West Bengal	11.0	500.0	13.0	—	613.0	—502.0
17. Delhi	—	18.0	39.0	—	72.0	— 72.0
18. H.P.	—	—	10.0	1.0	11.0	— 11.0
19. Nagaland	—	—	6.0	—	6.0	— 6.0
20. Manipur		—	10.0	—	10.0	— 10.0
21. Pondicherry	22.0	—	—	22.0	22.0	—
22 Tripura	—	—	3.0	—	3.0	— 3.0
	3697.7	2755.0	1212.0	330.0	4403.0	—705.3

ANNEXURE—8

Growth of Distillery Industry Manufacturing Alcohol

	No. of Distilleries	Capacity (in lakh litres)	Production
Beginning of Second Plan	(1956) 43	1,220.00	652.50
End of Second Plan	(1960-61) 53	1,800.00	918.00
End of Third Plan	(1965-66) 62	2,372.00	1,805.00
End of Fourth Plan	(1971-72) 80	4,780.00	2,600.00
End of Fifth Plan	(1975-76) 119	6,100.00	3,600.00 (Estimated)
	(1976-77) 119	6,100.00	4,000.00 (Estimated)

AIDA NOTE FOR THE THIRD MEETING OF THE COMMITTEE FOR STUDY OF INDUSTRIES BASED UPON ETHYL ALCOHOL TO BE HELD ON 9TH MAY 1977 IN THE MINISTRY OF PETROLEUM & CHEMICALS BACK GROUND

In the last 10-15 years, certain industries in the field of Chemicals, Pharmaceutical, Pesticides, Synthetic Rubber and Plastics based upon ethyl alcohol/ rectified spirit have been set up in the country. Proposals are also received by the Central Government from time to time for setting up new undertakings for different products based upon alcohol. The alcohol is produced in the country in distilleries set up in different areas. The alcohol so produced can be used both for potable as well as industrial purposes. The Government policy has been to encourage the use of alcohol for industrial purposes.

With a view to plan the growth and development of alcohol based industries in a sytematic manner and to ensure the optimum utilization of industrial alcohol, the Government of India has set up this Committee to make a study and prepare a report regarding the planning of the alcohol based industries.

The Association welcomes the idea of the Government of India of setting up the above Committee. However, AIDA is of the opinion that unless the constraints in the higher production of alcohol are removed, sufficient alcohol may not be produced to meet the demand of alcohol based industries.

The following points are worth consideration for boosting of the alcohol production.

I. Increase in the price of alcohol to give incentive for more production of industrial alcohol.

The Government of India Resolution dated 28th September, 1976 on the recommendations of the Tarill Commission on price structure of industrial alcohol made in February, 1975 states that "After a careful consideration of the matter in all its aspects including the revised price of molasses and the ability of the distilleries for better capacity utilisation on account of the easy availability of molasses, Government notified the revised prices of three categories of industrial alcohol on 31-10-75 as below". Thus the main issue is whether there has been better capacity utilisation and whether there is easy availability of molasses.

Capacity Utilisation

The Tariff Commission has based their recommendations on a capacity utilisation of 70%, taking into consideration various aspects of the working of the Industry. The contention of the Industry is that the all India actual capacity utilisation of different units for 1975 and 1976 are 60.1% and 60.8% respectively.

So far U.P. is concetned where bulk of the Industry is located, the figures of capacity utilisation are as under:

1975 — 46.2%
1976 — 52.9%

It may kindly be appreciated that while the distillery industry is suffering heavily on account of present controlled price of alcohol, the major consumers of alcohol are earning crores of rupees as profits because there is no control on the prices of their end products. The price of Synthetic rubber has been de-controlled. The products manufactured by Alkali & Chemicals were never under control. Thus whole the purchasers of industrial alcobol from distilleries are free to sell their products at any price that they can get, only the distilleries are compelled to sell tbeir industrial alcohol at remunerative prices.

II. Payment of Sales tax, Octroi Charges and Central Excise duty on molasses vis-a-vis Memorandum regarding increase in the price of alcohol.

The Tariff Commission has not included the items like Sales tax, Octroi charges and Central Excise duty on molasses. However, it has specifically recommended that this extra cost should be recovered through its inclusion in the molasses transport charges of actual by each distillery. (Para 31.6.4. of Tariff Commission Report 1975).

Pending final decision on the AIDA Memorandum for an increase in the price of alcohol, the Ministry of Chemicals & Fertilizers should issue necessary clarification by a Government Notification so that the distilleries are saved from harassment.

Cost Account Records Rules

It will not be out of way to point out that according to Notification bearing C.S.R. No. 594 (E) dated the 30th December, 1975 containing the cost Account Record (Industrial Alcohol) Rules 1975 issued by the Ministry of Law, Justice and Company Affairs, it is obligatory on every company manufacturing rectified spirit to secure compliance with the provisions of various rules under the above Notification as they are liable to maintain financial accounts as required under sub-section (1) of section 209 of the said Act.

It is therefore all the more necessary that all such costs which have not been included by the Tariff Commission while working on a fair price of alcohol should now be included in the revised price of alcohol.

III. Waivement of limit of charging only 15 paise per litre of alcohol towards "incidence of transport charges on molasses".

We take this opportunity of assuring the Ministry that the distilleries are prepared to lift molasses from far way places provided the limit of charging only 15 paise per litre of alcohol towards "Incidence of transport charges on molasses" is waived and the distilleries are allowed to charge as per actual expenses incurred by them on lifting molasses from far away places.

IV. Implementation of Recommendations of Jalan Committee both on Molasses and Alcohol.

In this connection we refer to the Jalan Committee Report wherein it has been pointed out that some distilleries were charging higher price for alcohol than that announced under the Ethyl Alcohol (Price Control) Order and that such distilleries contended that the present prices were unrealistic and hence higher prices had to be charged. The Committee has pointed out that though the question of appropriate price policy is not included in the terms of reference of the Committee, nevertheless the Committee emphasised the need for a realistic and viable pricing policy.

V. Adoption of Jalan Committee both on molasses and alcohol by State Government.

We draw the attention of the Government to the minutes of the meeting of the Central Molasses Board held on 18-12-1976 at New Delhi. The Report says "The Board adopted the recommendations of the Jalan Committee. Copies of the Report will be sent to the Chief Ministers of the States with the request that the recommendations made therein should be implemented expeditiously."

It may be emphasised here that if the recommendations of Jalan Committee are adopted by the State Governments expeditiously the major consumers of alcohol will not feel reluctant to lift alcohol from distilleries, situated in various States. We are sure that with the implementation of uniform excise levies the lifting of alcohol by the major consumers of alcohol will be very prompt with the result that the distilleries will produce more and they will not close down or work intermittently for want of Offtake.

While on the subject it may kindly be kept in view that there is no control on the prices of end products. The price of Synthetic rubber has been decontrolled. The products manufactured by Alkali & Chemicals were never under control. Thus while the purchasers of industrial alcohol from distilleries are free to sell their products at any price that they can get, only distilleries and that too only in Northern India are compelled to sell their industrial alcohol at unremunerative prices.

VI. Excise establishment charges and Licence fee.

We quote the recommendations of Tariff Commission in para 31.5 as under :

"We are, therefore, of the view that the distilleries which have to incur this expenditure should be reimbursed to the fully by way of an addition to the ex-works price recommended above on the basis of actual expenditure."

We submit that the Ethyl Alcohol (Price Control) Order should specify that the Industry may be allowed to charge the actual expenses under the above heads as applicable from state to state.

VII. Molasses and Alcohol Storage Fund vis-a-vis levy of Income Tax.

Under the Ethyl Alcohol (Price Control) Order it is mandatory for every distillery to create a separate fund @Rs. 6/- per K.L. for erecting storage tanks for molasses and alcohol. In this connection the Association has been informed that the Income Tax authorities are levying Income Tax on this amount by treating it as income.

Thus the amount allocated as above is not being allowed as a deduction in expenditure for income tax purposes, which in other words depletes the fund by 66.67% i.e. Rs. 4/- going out as tax out of every Rs. 6/- of the fund, leaving thereby the residual 33.33% of such fund for carrying out the necessary storage facilities. The Government may please appreciate that this amount being negligible, it shall take years for the fund to accumulate so as to be sufficient for erection of storage tanks for molasses/alcohol. This, evidently could not have been the intention of the Authorities, because the primary object in creating the fund is to conserve the raw material (Molasses) without any reasonable delay so that there is no loss of it for want of storage facilities.

As the above matter is of vital importance to be Industry, we request the Government to make necessary reference to the Central Board of Revenue so that the deductions by distilleries for storage funds are allowed as a permissible deduction while computing the income tax by the authorities.

VIII. Procurement of Khandasari Molasses for use in distilleries.

At present there is no control of the State Governments on the production and distribution of Khandsari molasses. This molasses is going for illicit distillation thereby reducing the income of the Government as Excise revenue.

If availability of molasses could be increased by controlling the Khandasari molasses, there would be more production of alcohol which when exported would earn foreign exchange in the World market for alcohol and as a matter of fact in previous years whenever there was surplus, the industry had exported alcohol through S.T.C. and earned valuable foreign exchange.

Thus while the State Governments will lose Excise revenue on account of alcohol shortage and illicit distillation by unscrupulous parties, the Government of India will have to import large quantities of alcohol on account of shortage of alcohol production in order to meet the requirements of alcohol based industries.

The Association is of the confirmed opinion that if all available Khandasari molasses is procured and allotted to distilleries for production of alcohol,

JALAN COMMITTEE REPORT

FORWORD

The Ministry of Chemicals and Fertilizers, Government of India, vide their memorandum No. 24(10)/74-Ch. III dated 28th February, 1976, constituted a committee for evolving uniformity in the levies of molasses and industrial alcohol under the Chairmanship of Dr. Bimal Jalan, Economic Adviser to the Government of India, Minister of Industry, with the membership below. In addition to the original members notified in the above memorandum, the Committee desired to co-opt Shri B. S. Dhavle, Commissioner of Prohibition & Excise, Government of Maharashtra as a member of the Committee. Shri B. R. Reddy, did not attend any meeting of the committee and therefore has not signed the report.

The Report of the Committee consists of two parts, viz: Part-I on Molasses, and Part II on Industrial Alcohol, Part-I of the Report on Molasses was finalised in August, 1976 and submitted to the Secretary, Ministry of Chemicals & Fertilizers by the Chairman, vide his D.O. No. EA/MAC/76 dated 25th August, 1976.

This is Part II of the Committee's report on Industrial Alcohol. The Committee takes this opportunity to thank the various State Governments for making available to it information on the levies on molasses and alcohol and other relevant data in connection with the preparation of this report. The Committee also wishes to thank the concerned alcohol-bases units, the Chemical Manufacturers' Association and the All-India Distillers' Association in responding to the queries and questionnaires issued to them by the committee. The committee also acknowledges with gratitude the services and assistance rendered by the Member-Secretary, Dr. K. S. Tiwari and Shri K. G. Ramakrishnan, Chief Research Officer of the Economic Adviser, Ministry of Industry in the collection and compilation of necessary data required by the committee and preparation of the report.

Members of the Committee

1. Dr. Bimal Jalan, Economic Adviser to the Govt. of India, Ministry of Industry	Chairman
2. Smt. Lata Singh, Director, Ministry of Chemicals Fertilizers.	Member
3. Shri B. R. Reddy, Director (Central Excise), Deptt. of Revenue & Banking Ministry of Finance.	Member
4. Shri R. S. Nakra, Chief Economic Division, Bureau of Industrial Costs & Prices.	
5. Shri A. K. Mukerji, Secretary (Excise), Govt. of West Bengal.	Member
6. Shri R. K. Sinha, Commissioner of Excise, Govt. of Bihar.	Member
7. Thiru Harbans Singh. Commissioner of Prohibition and Excise, Govt. of Tamil Nadu.	
8. Shri P. B. Joshi, Director of Prohibition and Excise, Govt. of Gujarat.	Member
9. Shri V. V. Sharma, Deputy Excise Commissioner, Govt. of Uttar Pradesh.	Member

there will be a substantial increase in the overall production of alcohol and the Government may not have to import alcohol to be utilised by the alcohol based industries within the country.

If our above suggestions are implemented by the State Governments, we are sure there will be a further production of about twenty million gallons of alcohol. This alcohol will enabe the State Governments to allow the establishment of more alcohol based industries. Moreover, the existing illicit distillation will stop leading to a very substantial increase in the Excise revenue of State Governments.

In view of above, the Government may please appreciate that there is a great urgency for strict Government Control on Khandasari molasses as it may not be difficult now for the Government to bring this molasses under its purview in view of levy of purchase tax and levy on sugar production etc.

17—1 M of PC & F/ND/78

10. B. S. Dhavle, Commissioner of Prohibition & Excise, Govt. of Maharashtra. — Member

11. Shri Shiv Inderpal Singh Mann, President All India Distillers' Association. — Member

12. Shri D. M. Trivedi, C/o Synthetics & Chemicals Ltd representing All India Chemical Manufacturers' Association. — Member

13. Dr. K. S. Tiwari, Development Officer-in-Charge (Chemicals) DGTD. — Secretary

PART-II — INDUSTRIAL ALCOHOL

PRODUCTION & CAPACITY

Alcohol is produced by the fermentation of molasses, which is a by-product of the sugar industry. Production of alcohol, therefore, has direct and linear relationship with production of sugar and molasses. Production of alcohol in India can be said to have started in 1931 when about 19 distilleries were set up, having a total production of about 3.7 million litres of potable alcohol in that year. Between 1931 and 1947, though the number of distilleries in the country remained at about the same level, production steadily increased from 3.7 million litres in 1931 to 60 million litres by 1946-47. Between 1947 and 1960, the number of distilleries increased from 19 to 51 and production to 81 million litres. From 1960 to 1966, the production of alcohol rose steeply consequent on growing demand for alcohol and increased availability of molasses, and reached a level of about 195 million litres in 1966. Production was depressed during the period 1965 and 1968, but again improved from 1969. Production of alcohol in the organised sector increased to 220 million litres in 1969 and to 280 million litres by 1975. The figures of production during 1974-75 (Dec.-Nov.) given by the various States at the meeting of the Central Molasses Board in November, 1975 was about 400 million litres.

2. It may be mentioned that the statistical picture regarding total capacity and number of units is somewhat unclear and different figures are available depending on the source. Thus, according to DGTD which is the focal point for collection of production statistics in the Central Government, the number of distilleries has more or less remained at the level of 68 units since 1968. The figures, however, do not give the complete picture regarding production of alcohol in the country as a few units which were either established during the period 1969-71 (when the industry was delicensed) or later continue to remain outside the rolls of DGTD. The Statewise production of alcohol by the units registered with DGTD is given in Annexure-I. It should be emphasized that these figures relate only to units registered with DGTD and exclude those are licensed by the respective States but are not borne on the list of the DGTD.

3. Of the units registered with DGTD, U.P. with 21 units (out of 68 units) accounted for about 50% of the installed capacity and 36% of the production in 1975. Maharashtra, Tamil Nadu and Andhra Pradesh, the three other major producers of alcohol accounted for 17%, 15% and 8% of the installed capacity and 20%, 14% and 11% of production respectively. Interestingly, W. Bengal, which is the major importer of classes from outside the State, accounted for only 2% of industrial alcohol capacity and 1.5% of production.

4. It may be mentioned that Tariff Commission had reported in 1975 that the total number of units existing in the various States as on 1-3-1973 was 88, spread over 13 States on the basis of information received from DGTD and the All India Distillers' Association. It is reported in the study of the Tariff Commission that the total installed capacity of these 88 units was 542 million litres and production 271 million litres in 1973. In the Co-operative Sugar Directory and Yearbook, 1975, published by the National Federation of Co-operative Sugar Factories Ltd., New Delhi, a list of 105 distilleries spread over 16 States/Union Territories has been given. A list of these units statewise, is also furnished in Annexure-II. (According to the Directory of All India Distillers' Association there were 118 distilleries). However, the existing 68 units registered with DGTD show the combined installed capacity of these units as only 340 million litres. 13 more units with a total capacity of 73 million litres have also been licenced/registered and these are under different stages of implementation. Annexure I and II are therefore not comparable. These registered with the DGTD are shown with asterik mark in Annexure II.

CONSUMPTION, IMPORTS AND EXPORTS

5. Alcohol is used both for potable and industrial purposes. In addition, some alcohol is used in drug and pharmaceutical industries, paints and varnishes etc. This Committee is concerned with only indutrial alcohol, and such this report will cover only this aspect of alcohol industry.

6. The demand for alcohol as estimated by the Tariff Commission in its 1975 report was 440, 484 and 532 million litres for the years 1974, 1975 and 1976 respectively. The actual production during the years as per DGTD data was only 235, 242 and 280 million litres, during the years 1973, 1974 and 1975 respectively. On the basis of these figures and taking into account the fact that exports/imports during these years have been negligible the above estimates of demand in 1973 seem to be rather high in the light of later developments.

7. The current consumption of alcohol for industrial purposes is estimated at about 265 million litres. In addition, a small quantity to the extent of 10-15 million litres is also required by units engaged in the production of drugs and pharmeceuticals, paints, varnishes, insecticides and pesticides. The balance quantity available is diverted for potable purposes. The following table shows the Statewise requirements of alcohol by industrial units as assessed at the meetings of the various Regional Committees held in the middle of May 1976. It may be clarified that these estimates were based after taking into account availability of alcohol in 1976 and past consumption and therefore do not represent the requirement of alcohol assuming full utilization of installed capacity. It is believed that if requirements were to be determined on the basis of installed capacities the estimate of total requirements given below may increase by 15 to 20 per cent.

Name of the State	Name of the Industry	Recommended allocation of alcohol during 1975-76 (in M.L.)
1. U.P.	Syn. & Chemicals & Somaiya Organics	68.0
2. Delhi	DDT Factory	1.8
3. Gujarat	Pharmaceuticals & other miscellaneous industries	12.0
4. Maharashtra	Union Carbide, Acetic Acid & others	75.0
5. West Bengal	ACCI & Others	45.0
6. Andhra Pradesh	Acetic Acid & others	32.0
7. Tamil Nadu	Chemplast and others (PVC)	21.0
8. Karnataka	Cellulose Acetate & others	8.0
9. Kerala	DDT Factory	1.8
	Total	264.6
		265.0

8. Though in earlier years imports of alcohol were sizeable in recent years imports have been negligible. Imports have also been fluctuating depending on the local availability of alcohol. From a ligure of 29.9 million kgs. in 1972-73, imports were reduced to 16.8 million kgs. in 1973-74. In 1974-75 and 1975-76 imports were negligible.

9. Exports of alcohol have also been negligible. During 1971-72 about 12.2 million kgs. of ethyl alcohol (undenatured) was exported of which 102 million kgs. was to Japan and 1.0 million kgs. to U.K. From 1972-73 exports dwindled considerably, and was confined to only Nepal, bulk of which was in the form of undenatured ethyl alcohol. Exports were 60,000, 34,000, 21,000 and just 1,000 kgs. during the years 1972-73, 1973-74, 1974-75, and 1975-76 respectively (vide Annexures III and IV).

10. In this context, it will be relevant to mention that export policy in respect of alcohol has been recently considered by the Government. The Ministry of Commerce by their letter dated 14th July, 1970 addressed to the Chairman,

had also requested this Committee to examine this question. The committee briefly discussed the issue. However, it was felt that since this subject was not formally within the terms of reference to the Committee, it would be in appropriate for it to make any recommendations in this respect. Although the Committee is not making any recommendations, it is perhaps reasonable to state that industrial alcohol should be exported only when there is a clear surplus over and above internal requirements. Since the output of sugar and molasses may fluctuate from year to year, it is necessary to make a careful assessment of availabilities before exports are undertaken. So far as levies on alcohol that may be exported are concerned, it may be mentioned that the recommendations of the Committee made later in the report for bringing about uniformity in State levies would facilitate exports of alcohol in a year when there is an internal surplus.

ALLOCATION OF ALCOHOL FROM SURPLUS STATES TO DEFICIT STATES

11. Allocation of alcohol from surplus states to deficit States is done every sugar year (December-November) by the Ministry of Chemicals & Fertilizers on the basis of concensus arrived at in the Central Molasses Board. Generally U.P., Maharashtra and Tamil Nadu are the major surplus States. A small quantity is also released every year from Bihar, Haryana and Karnataka.

12. As in the case of molasses, West Bengal, is the major deficit State in alcohol also. The lion's share of alcohol released from the surplus States goes to West Bengal every year. During the years 1973-74, 1974-75 and 1975-76 the share of alcohol released to West Bengal was 68%, 62% and 56% respectively. Details of alcohol released from surplus States and allocation made to deficit States during the years 1968-69 to 1975-76 are given in Annexures V and VI respectively.

PRICES OF ALCOHOL

13. In the earlier years, especially during war time, admixture of alcohol with petrol was in vogue and this continued till early sixties. Thereafter as a result of improvement in the supply position of Petrol, there was a virtual stoppage of such admixture. Therefore, the need arose for finding out alternative outlets for the use of alcohol apart from its use for potable purposes. To this end, the setting up of alcohol based industries such as synthetic rubber, plastics, synthetic fibres and other chemical industries, was recommended in the Alcohol Committee Report (1956). The Alcohol Committee felt that for the alcohol-based chemical industries to thrive, the supply of alcohol should be assured to them at a stable price over a period of time. The Committee thereafter recommended that the pricing and distribution of molasses and alcohol should be brought under control. Accordingly pricing of alcohol was brought under control by the Government of India in 1961 under the Ethyl Alcohol (Price Control) Order. Control over the price of molasses is fixed by the Government of India under the Central Molasses Control Order while some States which have their own Acts do so under their own Acts. Control over distribution of alcohol and molasses is done by the State Governments in consultation with the Ministry of Chemicals & Fertilizers.

14. The price structure of alcohol was referred to the Tariff Commission thrice in 1965, 1968 and in 1972. The recommendations made in the 1969 report of the Commission were valid upto 3-3-1972. Representations were received from the All India Distiller's Association (AIDA), etc. requesting the Government to increase the statutory price of industrial alcohol on various grounds. After considering the various grounds, on 16-9-1972 Government decided to make a reference to the Tariff Commission to review again the price structure on the basis of last data and make recommendations to the Government.

15. The Commission submitted an interim report in July, 1974 and the final report in 1975. Following the increases allowed in the case of the three grades of Molasses in November, 1975 and in the light of the recommendations made by the Tariff Commission in 1975, Government revised the prices of absolute

alcohol and rectified spirit. Under the Ethyl Alcohol (Price control) Order, 1971, prices specified in respect of absolute alcohol and rectified spirit as per specifications mentioned therein prior to and after 31-10-1975 are as follows:—

Price of Alcohol under the Methyl Alcohol (Price Control) Order, 1971

Specifications	Prices (Rs. /Kilo Litre) Upto 31-10-75	w.e.f. 1-11-75
1. Absolute Alcohol conforming to ISI Standard No. 322-1952 naked for equivalent volume at 100 per cent V/V Strength	250.50	668.41
2. Rectified spirit conforming to ISI standard No. 323-1959, naked for equivalent volume at 100 per cent V/V Strength	242.37	622.20
3. Rectified spirit conforming to ISI Standard No. 323-1959 naked for equivalent volume at 94.68 per cent V/V Strength.	229.47	589.10
ADDITIONAL CHARGES		
a) Where alcohol is supplied after denaturisation with general or special denaturants or accordance with the specifications prescribed in the excise limit, the total cost of such denaturants plus,		
(i) if denaturants are supplied by purchasers	2.00	2.50
(ii) In all other cases may be charged in addition to the price specified	5.00	6.50

16. It will be seen from the above table that price increase given with effect from 1-11-1975 was 167 per cent in the case of absolute alcohol and 157 per cent in the case of rectified spirit of both standards. It may be mentioned that prior to the revising of alcohol prices, the price of Grade I molasses was raised from Rs. 10 to Rs. 60 per tonne and Grade II molasses from Rs. 8 to Rs. 48 per tonne. The revised prices took into account the effect of the increase in the price of molasses.

LEVIES ON INDUSTRIAL ALCOHOL

17. At present alcohol for industrial uses is consumed in the form of absolute alcohol, rectified and denatured/special denatured spirit. There are various levies imposed by different States under different names such as State Sales Tax (most of the States), surcharge on State Sale Tax (Gujarat, Bihar, Tamil Nadu and Haryana), State excise duty (most of the States), administrative charges (UP), special fees (Maharashtra and Gujarat), gallonage fee (Tamil Nadu and Andhra Pradesh), pass fee (West Bengal), permit fee (Bihar & Haryana), entry tax (West Bengal), transport fee (Maharashtra) purchase tax (UP) vend fee (UP) and licence fee (West Bengal and UP). On alcohol exported from one State to another, in addition to some of these levies or in lieu of some of these, there are levies like Central Sales Tax (all States), export fee (Maharashtra, Bihar and Haryana), export pass fee (UP) etc. In addition to these the consuming industries have to bear transport charges and octroi duty at varying rates depending on the distance to be covered and the status of the station (panchayat, municipality, metropolitan area etc.). Further, in some States, there are licence fees based on installed capacity, and establishment charges. The various levies on industrial alcohol currently charged (1975-76/1976-77) in some of the important alcohol-producing States both on alcohol consumed within the State and on that exported to other States for industrial uses have been compiled in a tabular form and are given in Annexures VII and VIII respectively.

18. It may be mentioned that the levies other than State excise duty and State Sales tax happen to be levied partly out of historical reasons and partly as a result of the State High Courts declaring some of the levies ultra vires on writ petitions filed by industrial units, mainly in U.P., Andhra Pradesh and

Bihar and consequent imposition of fresh levies by these States. It will also be observed that the structure of State levies and charges is complicated and variable from State to State. Some of the levies are on ad valorem basis and some others at specific rates. Even for industrial purposes, the levies are not uniform in the same State for the three varieties of alcohol like absolute alcohol, rectified spirit and denatured/special denatured spirit. As a result, the incidence of levies is different in different States. The various levies currently in force in some of the major alcohol-producing States are given in the following paragraphs.

UTTAR PRADESH

19. An administrative charge of Rs. 7.50 per kilo litre is charged on special denatured spirit supplied to Synthetics and Chemicals Ltd., Bareilly. A vend fee of Rs. 1.10 per bulk litre on special denatured spirit was in force in 1973, but this has since been struck down by the Allahabad High Court from 24-3-73. A sales-tax of 40 paise per bulk litre was imposed since April, 1974 by an ordinance amending the U.P. Sales of Motor Spirit, Diesel Oil and Alcohol Thereafter the U.P. legislature passed on 20-5-1976 the U.P. Sales of Motor judgement dated 11-7-1975 struck down the levy as unconstitutional and void. Thereafter the U.P. legislature passed on 20-5-1976 the U.P. Sales of Motor Spirit, Diesel Oil and Alcohol Taxation (Amendment) Act, 1976, imposing a purchase tax @ 40 paise per bulk litre on the first one million litres and 20 paise per bulk litre over one million litres with retrospective effect from 2-5-1974. This has been challenged by Synthetics and Chemicals Ltd., and is pending in the High Court. On alcohol exported to other States, an export pass fee of Rs. 1.75 per alcoholic litre on rectified spirit and Rs. 0.25 per bulk litre on denatured spirit is charged. The Control Sales Tax on interstate sales is 4 per cent. There is also a licence fee of Rs. 3.50 per kilo litre on production of alcohol.

MAHARASHTRA

20. On industrial alcohol cosumed within the State there is a State sales-tax of 15 per cent. Though there is a State excise duty of Rs. 25 per proof litre, this is not applicable for alcohol used for industrial uses. When issued on payment of duty a special fee of Rs. 0.41 per bulk litre is charged. In addition there is a transport fee of Rs. 0.05 per bulk litre when issued under bond (without payment of duty). Octroi varying from $\frac{1}{2}$ per cent to 6 per cent on ad valorem basis is levied by municipalities or gram panchayats on industrial alcohol and forms the revenue of such agencies. On alcohol exported to other states there is an export fee of Rs. 0.25 per bulk litre and a central sales tax of 4 per cent.

WEST BENGAL

21. For alcohol consumed or used in the Calcutta Metropolitan area, an entry tax is levied. This is 7 per cent ad valorem on rectified spirit required for bonafide use in the manufacture or drugs and medicines and brought into the Calcutta Metropolitan Area by drugs and Pharmaceutical manufacturers. On special denatured spirit the rate is 3 per cent ad valorem. Central Sales Tax is attracted when alcohol is imported from a State where sales tax is levied on alcohol. In addition there is a pass fee of Rs. 0.10 per bulk litre on special denatured spirit. There is also a vend fee for retail sale licence per annum on alcohol and rectified spirit. For special denatured spirit, the vend fee is Rs. 100/- when the quantity sold in the previous year does not exceed 10,000 bulk litres and an additional Re. 1/- per 100 bulk litres when the quantity exceeds 10,000 bulk litres. On industrial alcohol exported to other States, State Sales Tax and surcharge on a sales tax is exempted. However, State excise duty is charged at the rate in force in the State or Union Territory of import. While there is no pass fee on absolute alcohol and rectified spirit, a pass fee is liable to be charged at the rate at which it is charged within the State on special denatured spirit. No denatured spirit, is however, exported from West Bengal.

TAMIL NADU

22. In Tamil Nadu on alcohol consumed within the State the excise duty charged is Rs. 8/- per litre (which is equivalent to Rs. 12.80 per bulk litre). There is in addition a gallonage fee of Re. 1 per bulk litre on absolute alcohol and rectified spirit and Rs. 0.25 per bulk litre on special denatured spirit. For alcohol used for industrial purposes, (i.e. where the end-products are free from alcohol) there is only an excise duty of Rs. 0.10 per proof litre and a gallonage fee of Rs. 0.10 per bulk litre on rectified spirit and absolute alcohol and Rs. 0.25 on denatured spirit. The State sales tax is 8 per cent on the first point of sale and surcharge of 5 per cent for Madras City and its suburbs, Salem, Coimbatore, Madurai and Trichy towns. On alcohol exported to other States, the State excise duty is Rs. 0.50 per bulk litre on rectified spirit and absolute alcohol and a gallonage fee Rs. 0.25 per bulk litre on denatured spirit including methylated spirit and methanol. On interstate exports, the Central Sales tax is 4 per cent against 'C' form (otherwise 10 per cent).

BIHAR

23. Within the State the sales tax is 7 per cent on denatured and rectified spirit. There is also a surcharge of 1 per cent of sales tax. In addition there is a gallonage fee of Rs. 0.75 per litre on alcohol consumed within the State. On alcohol exported to other States, Bihar levies an export fee of Rs. 0.75 on denatured spirit, Rs. 0.25 on special denatured spirit and Rs. 1.60 per bulk litre on rectified spirit and absolute alcohol. The Central Sales-Tax on exports is 4% against 'C' form and 11% in other cases.

ANDHRA PRADESH

24. Rs. 0.02 per bulk litre is charged on rectified spirit supplied to industries in cases (i) when alcohol is destroyed or converted chemically into other products and the end product does not contain any alcohol, and (ii) when alcohol is used as a solvent or as a processing agent and the end-product does not contain any alcohol. In all other cases full excise duty is levied on rectified spirit supplied to these industries in which alcohol appears in the final product to some extent whether or not such a product is capable of being used or misused as an intoxicant. On denatured spirit a gallonage fee of Rs. 0.22 per bulk litre used to be charged under the Andhra Pradesh Denatured Spirit Rules, 1971, but since the Andhra Pradesh High Court held collection of such a gallonage fee as illegal, no such fee is collected on the denatured spirit supplied for any use. Subsequently, the State Government has started charging Rs. 0.20 per litre as excise duty with effect from 14-8-1976, on rectified spirit and Rs. 0.15 can denatured spirit. There is a countervailing duty of Rs. 0.10 on industrial alcohol imported from other States.

GUJARAT

25. The State sales tax is 15 per cent on all varieties of industrial alcohol. There is a state excise duty of Rs. 15.00 per proof litre on absolute alcohol and rectified spirit. The surcharge on sales tax is 1.5% on all varieties of alcohol. In addition there is special fees of Rs. 0.41 per litre and transport fee of Rs. 0.22 per litre on both absolute alcohol and rectified spirit. There is no State excise duty on industrial alcohol (i.e. special and ordinary denatured spirit). However, a proposal to levy a vend fee of Rs. 0.20 per litre instead of the existing rate of Rs. 0.17 on denatured spirit and Rs. 0.05 on special denatured spirit is under consideration. No special fee and transport fee are levied on rectified spirit and absolute alcohol on exports made out of State.

HARYANA

26. The sales tax levied on alcohol consumed within the State is 6 per cent. There is also a surcharge on sales tax at 2 per cent. In addition there is State excise duty of Rs. 7 per proof litre on absolute alcohol and rectified spirit, and a profit fee of Rs. 2 per bulk litre on special denatured spirit. As regards alcohol exported to other States, an export fee of Re. 1 per proof litre on absolute

18—1 M of PC & F/ND/78

alcohol and rectified spirit and Re. 1/- per bulk litre on special denatured spirit, and a Central sales tax of 4 per cent on sales to registered dealers and Government departments are levied.

KARNATAKA

27. The information received from the Government of Karnataka is not complete. But from the figures that are available, an excise duty of Rs. 0.20 per bulk litre is charged on industrial alcohol used within the State and Rs. 0.05 per litre is levied on industrial alcohol exported outside the State. The representative of the I.C.W.A. present at the meeting stated that sales tax in Karnataka State on industrial alcohol is of the order of 25 per cent.

REALISATION OF REVENUE FROM ALCOHOL

28. The Committee had requested the various State Governments to intimate the total revenue realised from industrial alcohol by way of various levies charged by them separately. While a few of the State Governments have furnished the revenue realised from alcohol on some of the levies separately, majority of the States have stated that separate figures are not available. It is noticed that the figures of revenue supplied by them relate to alcohol used for all industrial purposes including medicinal and toilet preparations. The revenue figures also pertain to levies on alcohol consumed within the State and that exported to other States. The revenue realised by some of the major State Governments from alcohol during the last three years, i.e. 1973-74 to 1975-76 as reported by them has been tabulated and is given in the following table.

Revenue realised by selected State Government by way of levies charged on alcohol

(Rs. lakhs)

S. No.	State	1973-74	1974-75	1975-76
1.	Andhra Pradesh	61.3	62.0	N.A
2.	Bihar	55.61	66.52	73.88
3.	Gujarat	10.58	6.07	6.47
4.	Maharashtra	99.8	93.5	89.4
5.	Uttar Pradesh	108.8	268.9	173.9
6.	West Bengal	43.8	47.8	74.1
7.	Tamil Nadu	*391.1	285.9	116.2
8.	Haryana	30.6	83.1	52.6

Note : (The above figures do not include realisation from sales tax).

*Part of the revenue realised includes revenue from rectified spirits used for potable purposes.

29. This committee was constituted to examine above structure of State levies on alcohol, to make recommendations for achieving uniformity in these levies. Prima facie, it is evident that the structure of levies in the States is both complicated and non-uniform. Some of the levies are charged on ad valorem basis and some others on specific rates. In the present stage of the development of alcohol-based industries, the Committee considered whether such a structure was conducive to orderly development of these industries. In order to take cost structure of alcohol-based industries and the impact of levies on total costs. Since the data were not readily available, manufacturers were requested to provide this information. In addition to the cost of manufacture of alcohol-based industries, the Committee also requested data on the likely cost structure of similar industries based on the alternative raw materials, i.e. naphtha. In the following paragraphs a brief review of the alcohol-based industries has been attempted.

ALCOHOL BASED INDUSTRIES

30. The three most important end-product groups of the organic chemical industries are plastics, synthetic fibres and synthetic elastomers. These together

with other important synthetic organic products such as detergents, pesticides, dyestuffs, pharmaceuticals, paints solvents etc., have shown spectacular increase in production during the last decade in most of the Western countries and in Japan. A wide range of the above chemical products were first made from non-petroleum raw materials and these raw materials are still being used to some extent. Such non-petroleum raw materials are ethyl alcohol by fermentation, calcium carbide and coke oven by-products. As natural materials could not meet the entire demand for synthetic products most of the countries including India switched over to petrochemical products during the sixties and early seventies. However, the abnormal increase in oil prices since November 1973, end-products based on naphtha have become costlier. The advantage to alcohol-based industries due to increase in naphtha prices has, however, been partly neutralised by the increase in the price of alcohol and molasses.

31. Ethyl alcohol is a chemical which can be readily converted into either ethylene or acetaldehyde both of which are important starting points for synthetic chemicals. Alcohol-based industhies can be established with comparatively small initial capacities. The use of ethyl alcohol enables the production of high purity ethylene straight-way without any corresponding problem of by-products and their utilisation as occurs in the case of petrochemical ethylene.

32. Based on the information already available with DGTD and that obtained from the various alcohol-based industries, the position of some important industries is given below: —

33. **Synthetic Rubber**

Ethyl alcohol is converted to ethylene by dehydration process. This ethylene obtained from ethyl alcohol is reacted with benzene to give ethyl benzene. Ethyl benzene is finally dehydrogenated to convert it to styrene monomer. Ethyl alcohol is dehydrogenated to acetaldehyde. Acetaldehyde and ethyl alcohol when passed over a dehydrated catalyst, butadiene monomer is produced. This styrene and butadiene on polymerisation gives various grades of synthetic rubber (SBR). At present the only unit manufacturing SBR is Synthetics & Chemicals Ltd., Bareilly. The capacity of this unit is 30,000 tonnes per year. Production during 1975 was 22,578 tonnes. The consumption of alcohol by this Unit in 1975 was about 40 million litres.

34. **PVC resins compounds**

Alcohol is heated to crack and obtain ethylene gas which is chlorinated with chlorine/hydrochloric acid to obtain ethylene dichloride which is further cracked to obtain V. C. monomer which on polymerisation produce PVC resin. PVC resin is compounded by mixing with suitable plasticizers, additives and colouring agents etc. There are in all five units in the country with an installed capacity of 64,700 tonnes. Of these, Chemicals and Plastics of India Limited is the only alcohol-based unit. The capacity of this unit is 12,000 tonnes. Production of this unit in 1975 was 9,458 tonnes. The alcohol consumed by this unit in 1975 was a little less than 12 million litres.

35. **Low density polythylene**

Ethylene is generated by cracking alcohol which is polymerised into low density polythylene. There are two units in the country manufacturing LDPE of which Alkali and Chemical Corporation of India Limited (ACCI) is based on alcohol. The capacity of ACCI is 10,000 tonnes and production during 1975 was 12,600 tonnes. ACCI consumed about 33 million litres of alcohol in 1975-76.

36. **Acetic Acid**

Ethyl alcohol on dehydrogenation gives acetic acid. There are nine units in the country producing this item with a combined capacity of 30,000 tonnes Production of these nine units in 1975 was about 20,000 tonnes. Of these, the major alcohol-based units are Indian Organic Chemicals Ltd., Andhra Sugars Ltd., Somaiya Organics Ltd., Kolhapur Sugar Ltd., etc. There is no price control on acetic acid.

37. **Acetate rayon yarn/fibre:** Acetic acid/acetic anhydride, ethyl acetate and acetone are the chemicals for which alcohol is the starting raw material and these chemicals are used for the manufacture of cellulose acetate yarn/fibre. Besides alcohol as the starting raw material, acetone is also produced from petrochemical feedstock. Sirsilk Ltd., Sirpur, Kagaznagar is only unit which produces this product. The capacity of the unit is 2300 tonnes and production in 1975 amounted to 2210 tonnes.

38. **Polystyrene:** Alcohol is cracked to generate ethylene which is condensed with benzene to get styrene monomer on polymerisation produces polystyrene. There are two units in the country with a combined capacity of 17,500 tonnes of which Polychem's capacity is 16,000 tonnes. Production of this unit in 1975 was 7,469 tonnes.

39. **Other products:** A number of other products such as butanol, ethyl acetate, buthyl acetate, 2-ethyl hexanol acetic anhydride, acetone etc. are also manufactured from alcohol-based ethylene. Some of these products are intermediates to the manufacture of a number of chemicals, insecticides, pesticides, dyestuffs etc.

40. An attempt was made by the Committee to estimate the incidence of alcohol price (excluding levies) on the prices of end-products in order to assess the impact that alcohol prices and levies may have on prices of end-products. Data received from manufacturers were, however, fragmentary and because of the delay in receiving this information and the limited time available to the committee, the committee, was unable to make an independent assessment of cost of the concerned units. Nonetheless in order to provide some idea of the magnitude of the incidence of alcohol price in the price of end products (excluding levies), the committee tried to assess the incidence of alcohol prices of some major end-products on the basis of information available from DGTD and manufacturers. The relevant data are given in the following table. To eliminate the impression of spurious accuracy, the figures given in column 4 of the table, viz: incidence of alcohol price in the prices of end products, have been rounded. For the purpose of compilation of this table, a mean price of Rs. 0.80 per litre, exclusive of levies has been taken.

Incidence of alcohol prices in the ex-factory prices of some major alcohol-based products

Product	Alcohol coefficient required per tonne of end products (kilo litres)	Ex-factory price of product for tonne (1976) in rupees	Incidence of alcohol price in price of end-product (per cent)
Synthetic Rubber	2.6	8,000	26
Acetic Acid	1.3	5,300	20
Butanol	1.9	7,000	22
Acetic Anhydride	1.6	8,500	15
Cellulose Acetate Yarn/Fibre	3.3	22,000	12
Polystyrene	0.7	9,000	6
LD Polyethylene	2.7	8,500	25
PVC Resin/Compounds	1.2	5,100	19
Acetaldehyde	1.3	4,000	26
Butyl Acetate	1.9	8,000	19
Ethyl Acetate	1.3	5,800	18
2-Ethyl Hexanol	3.3	8,500	31
D.O.P.	2.4	9,500	20

41. An attempt was also made to calculate the impact of various levies on the price of alcohol used for industrial purposes in some of the major alcohol-producing States. Since the levies are both specific and ad valorem, it was necessary to convert them into a uniform rate per unit of alcohol consumed. The following table shows the total impact of levies as percentage on the basic price of alcohol in different States. For this purpose only major levies have been taken and a basic price of Rs. 0.80 per litre, exclusive of levies, has been assumed for alcohol. Exemptions and concessions to particular industries from the levies are given by different States. The impact of these concessions and exemptions is not reflected in the table.

State	Levies			Total per litre in (Rs.)	Levies of percentage of basic prices of alcohol
	Sales tax		Gallonage fee/vend fee/permit fee/purchase tax etc. per lit. (Rs.)		
	Per cent per litre Rs.				
U.P.	..	0.10	0.40 0.20	0.40 0.20	50.0 25.0
Maharashtra	15	0.12	0.05	0.17	21.3
Tamil Nadu	8	0.06	0.25	0.31	38.8
Bihar	7	0.06	0.75/ 0.30	0.81/ 0.36	100.0/ 45.0
Gujarat	16.5	0.13	0.17	0.30	37.5
Andhra Pradesh	7	0.05	00.20	0.26	32.5

42. Because of the differing incidence of levies in different states, the economics of production of end-products depends heavily on the source from which alcohol is produced. For example it is estimated that the impact of levies in the exfactory price of acetic acid for a unit could vary from 18 per cent in one State to 4% in another State. (This estimate is based on a uniform price of Rs. 5700 per tonne of acetic acid and a uniform alcohol coefficient of 1.3 kilo litres per tonne of acetic acid.) Similarly the impact of levies on alcohol on the price of L.D. polyethylene could vary from 5 per cent to 13 per cent depending on the location of a unit. In order to reduce the impact of high levies, some States provide concession to specified industries, which may further complicate the structure of levies.

CONCLUSION AND RECOMMENDATIONS

43. The levies charged by the various State Governments vary from state to state and are complicated and non-uniform. In some states there exist a multiplicity of levies, while in some other states there exist only a few levies and for industrial purposes certain of these levies are also exempted.

In some cases, stay orders have been granted by High Courts to industries. On the basis of analysis of cost data supplied by manufacturers of alcohol-based industries, the Committee also noted that the present price paid by industrial units including the basic price and all other levies imposed on alcohol makes some of the end-products costlier than similar products based on naphtha. However, the committee was unable to carry out a detailed cost analysis of naphtha based industries as against alcohol based industries in order to verify it.

44. It will be observed from Annexeure VII that the sales tax/purchase on industrial alcohol varies from 6 per cent in Haryana to 16.5 per cent in Gujarat to 25 per cent in U.P. There is also State excise duty and/or other levies at varying rates at Rs. 0.75 per litre in Bihar Rs. 0.10 per litre in West Bengal, Rs. 0.20 per litre in Andhra Pradesh and Rs. 0.25 per litre in Tamil Nadu. In Tamil Nadu and Bihar instead of excise duty there is gallonage fee. The total

incidence of these levies on alcohol used for industrial purposes jack up the price of alcohol and industrial units are required to pay an ex-distillery price exclusive of levies of Rs. 1.30 per litre in Tamil Nadu, Rs. 0.72/Rs. 0.70 in Maharashtra, Rs. 0.77 to Rs. 1.10 per litre in Andhra Pradesh, Rs. 1.00 per litre in U. P. Transport and octroi charges will be extra. If alcohol is imported from outside the State, the price of alcohol is likely to be still higher. For example, it was reported to the Committee that one industrial unit in Andhra Pradesh paid Rs. 2.43 to 2.75 per litre at their works for the alcohol imported from another State, whereas from the local distilleries in that State the price paid ranged between Rs. 1.17 to Rs. 1.49 per litre.

45. As against the level of sales tax, excise duty and other levies mentioned above, it seems that the rate of State sales tax on other industrial raw materials in many states is substantially lower. Examination of the prevailing sales tax rates in U.P., Maharashtra, Gujarat, Tamil Nadu, Karnataka, Andhra Pradesh, Bihar and West Bengal shows that cost of the raw materials were being charged at the rate of 2 to 4 per cent for basic raw materials which is the same as the rate notified for declared goods under the Central Sales Tax Act, 1956. In some exceptional cases of intermediate category like construction materials, the highest rate of sales-tax was 8% and only in consumer durables, and luxury items, a rate ranging between 10 to 15 per cent is being levied.

46. In view of the importance of encouraging the future development of alcohol-based industries in an orderely manner, the Committee would like to make the following recommendations in respect of levies and other charges on industrial alcohol.

(i) It is clear that the present structure of various levies and charges is complicated and cumbersome. Instead of retaining the various levies that are known by different names in different States such as purchase tax, vend fee, administrative charges, gallonage fee etc. the Committee would suggest that these levies should be reduced to one levy, and all other levies should be abolished. The Committee was informed that the constitution empowers the State Government to levy excise duties on potable alcohol only, and not on alcohol used for industrial purposes, denatured or otherwise. In view of this, in order to bring about some uniformity in the structure of levy in various States, the Committee would recommend that States may impose a single uniform levy/fee, by whatever name it is called. On alcohol used for industrial purposes, denatured or otherwise. Needless to add that such a levy should at a reasonable level.

(ii) In addition to the above levy, States may also levy a sales-tax which is attracted by most other goods. However, there does not seem to be sufficient justification for charging a rate of sales tax on alcohol for industrial use, which is higher than that on other industrial raw materials. As pointed out in paragraphs 44 and 45, the present rates of sales-tax on industrial alcohol varies from 6 per cent to 16.5 per cent. In addition there is a surcharge which varies from 1 to 5 per cent. As against this, rate of sales tax on other industrial raw materials in many states is substantially lower. The committee would recommend that alcohol for industrial use should be treated as any other industrial raw material and that the rate of sales tax on this raw material should be comparable to sales tax on other industrial raw materials in their own States.

(iii) The Committee would also recommend that there should be no additional levy or fee on export of industrial alcohol from surplus States. In other words, the total incidence of duty of alcohol exported out of the States should be no higher than on alcohol used for internal consumption. This would be consistent with the prevailing practice in respect of other raw materials, and there can be little doubt that free movement of raw materials within the country will be in the overall economic interest. Units located away from alcohol producing States are already at a disadvantage because of transport costs, and there is a little justification for putting them under a further disadvantage. In any case distribution of alcohol is subject to control and State Governments are deciding the quantities that may be allowed to be moved out of States.

(iv) As part of the package suggested above, it is recommended that importing States may also do away with the entry tax on countervailing fees/levies charged by them.

47. The above recommendations should be treated as a package, and the Committee hopes that, when implemented, these would bring about much desired uniformity as well as simplification of the existing structure of levies and other charges on this important industrial raw material. The package of measures suggested above in respect of levies is likely to yield the best results if it is accompanied by a uniform price of alcohol as well as its raw material, molasses (excluding, of course transport costs). It was pointed out to the Committee that some distilleries were charging a higher price for alcohol than that announced under the Alcohol Price Control Order. On behalf of the distilleries, it was contended that the present price were unrealistic in certain states and that higher prices had to be charged in order to make the continued operations of distilleries viable. The question of an appropriate price policy is outside the terms of reference of this Committee. Nonetheless, the Committee would like to emphasis the need for a realistic and viable pricing policy for molasses and alcohol, which would provide a reasonable price to the manufacturer while at the same time safeguarding the interests of consumers, ensuring molasses and alcohol inside the country.

48. The representatives of States Governments pointed out that as a result of these measures, there may be some loss of revenue to the States, and alternative ways of meeting this loss would have to be explored. On the other hand, it was pointed out that the rationalization of the tax structure may lead to healthier growth and faster expansion of alcohol based industries, which in itself would lead to increase in State revenues.

ANNEXURE — I

Statewise Production of Industrial Alcohol

Sr. No	State	No. of Units (1975)	Installed capacity as on 31-12-75 (million litres)	Production in million litres 1973	1974	1975
1.	Uttar Pradesh	21	166	85	84	101
2.	Maharashtra	8	50	46	45	56
3.	Andhra Pradesh	9	34	24	25	31
4.	Karnataka	3	17	18	20	14
5.	Bihar	6	23	14	17	17
6.	Tamil Nadu	4	19	22	22	26
7.	Punjab	2	7	10	11	13
8.	West Bengal	3	7	2	2	4
9.	Haryana	2	6	4	4	5
10.	Gujarat	2	6	2	2	3
11.	Kerala	3	4	2	3	4
12.	Rajasthan	2	2	1	1	1
13.	Madhya Pradesh	3	7	3	3	4
		68	349	235*	242*	279

Note: The above data pertain to only units borne on the list of DGTD.

* Totals may not tally with the sum of the individual figures due to rounding off.

Source: D.GT.D.

ANNEXURE—II

LIST OF DISTILLERIES (1965)

S. No.	*NAME OF DISTILLERY*
Andhra Pradesh (13)	
*1.	A. P. Government Power Alcohol Factory, Shakarnagar, Dist. Nizamabad.
*2.	Andhra Sugars Ltd. Venkatarayapuram, Tanuku.
*3.	Andhra Winery & Distillery, Malkajgiri, Sec'bad-17.
*4.	Anakapalle Cooperative Agricultural and Industrial Society Ltd. P.O. Thummapalla, Dist Vizagapatnam.
*5.	Deccan Sugar and Abkhari Co. Ltd., Samalkot, Dist-East Godavari.
*6.	Govt. Distillery, Narainguda.
*7.	Hindustan Polymers Ltd., Pandurthy Road, Vizag.
*8.	K. C. P. Ltd., Vuyyuru, Dist. Krishna.
*9.	Kirlampudi Sugars Ltd., Pithapuram, Dist., E. Godavari.
*10.	Srirama Sugar and Industries Ltd., Bobbili, Dist. Srikakulam.
*11.	Sri Sarvaraya Sugars Ltd. Challuru Dist. E. Godavari.
*12.	Sreenivasa Distilleries, Chittore.
*13.	Vinedale Distilleries (P) Ltd. P.O. Gajaampalnad, Hyderabad.
Assam (1)	
*14.	Assam Cooperative Sugar Mills Ltd. (Distillery) P. O. Baruabamugaon, Dist. Sibsagar.
Bihar (7)	
15.	Arun Chemical Industries Private Ltd., Sultangang, Dist. Bhagalsur.
16.	Bihar Distillery, Pachurukhi, Dist. Siwan.
*17.	Cawnpore Sugar Works Ltd., Marhowarh, Dist. Saran.
*18.	New Swadeshi Sugar Mills Ltd., Narkatiaganj, Dist. Champaran.
*19.	Ranchi Distillery, P. B. 62, Ranchi.
*20	S. K. G. Distillery (Lauriya) Lauriya, Dist. Champaran.
*21.	S. K. G. Distillery (Malhua) P. O. Mirganj, Dist. Saran.
Goa (3)	
22.	Anand Distillery, Rua D. Louranso, Panjim.
23.	Associated Brewries and Distilleries, Cortalim, Goa.
24.	Venus Distillery and Brewery, Chandoke, Goa.
Gujarat (3)	
*25.	Alembic Chemicals Work Co. Ltd., Alembic Road, Baroda.
*26.	Gujchem Distilleries India Ltd., P. O. Sardesai Factory, Bilimora, Dist. Bulsar.
27.	Shree Bilaswar Khand Udyog Khednt Sahkari Mandli Ltd., Kodinar.
Haryana (3)	
*28.	Karnal Distillery Co. Ltd., Karnal.

*29. Haryana Distillery, Industrial Area, Yamunanagar, Dist. Ambala.

30. Panipat Co-operative Distillery, Panipat.

Karnataka (8)

31. Amrut Distilleries, Sampangi, Tank Road, Bangalore-27.

32. Hiranyakesi S. S. Niyamit, Samteshwar, Dist. Belgaum.

*33. India Sugar and Refinery Ltd., (Pampsar Distillery), Hospet, Dist. Bellary.

34. Khoday Distilleries Private Ltd., Bangalore.

*35. Mysore Sugar Co. Ltd., Mandya.

36. Nandi Breweries and Distilleries (P) Ltd., 9th Milestone, Tumkur Road, Bangalore.

*37. Ugar Sugar Works Ltd., Ugar Khurd, Dist. Belgaum.

38. Yezdi Distilleries, Bannimandap Layout, P. B. No. 56, Mysore-16.

Kerala (4)

39. Co-operative Sugars Ltd., Chittoor, Menonpare, Dist. Palghat.

*40. Mc. Dowell & Co. Ltd., (Distillery), Shertally, Dist. Alleppey.

*41. Polson Distillery P. B. No. 6, Chalakudi.

*42. Travancore Sugars & Chemicals Ltd., Tiruvalla.

Madhya Pradesh (4)

43. Bharat Breweries and Allied Industries, Gwalior.

44. Chhatisgarh Distillery, 4 Industrial Estate, Bhilai.

*45. Cox Distillery, Nowgong (Bkd).

*46. M. P. State Industrial Corpn. Ltd., Ratlam Alcohol Plant, Ratlam.

Maharashtra (20)

*47. Brihan Maharashtra Sugar Syndicate Ltd., Sheerpur, Dist. Sholapur.

48. Deokar's Distillery, MIDC Plot No. D-1, Khedi, Chiplun, Dist. Ratnagiri.

*49. Govt. Distillery, Chitali, Dist. Ahmednagar.

*50. Kolhapur Sugar Mills Ltd., Kolhapur-3.

51. Krishna S. S. K. Ltd., Rethare Budruk, P.O. Shivnagar Dist. Satara.

*52. Maharashtra Distilleries Ltd., Addl. Industries Area, P.O. Chikalthana Dist. Aurangabad.

53. Panchaganga S. S. K. Ltd., Ganganagar, Ichal-Karanji, Dist. Kolhapur.

*54. Polychem Ltd., (Distillery) Nira, Dist. Poona.

55. Pravarnagar S. S. K. Ltd., Pravarnagar Dist. Ahmednagar.

56. Rahuri Sahakari Sakhar Karkhana Ltd., Shrishivaji Nagar, Dist. Ahmednagar.

57. Ramon Distilleries Ltd., C-16, Trans Thana Creek, MIDC Indl. Area, Thana, Belapur.

58. Satpuda Tapi Parisan S. S. K. Ltd., P.O. Purushottam Nagar Dist. Dhulia.

*59. Shetkari Sahakari Sakhar Karkhana Ltd., Sangli.

60. Shree Shankar S. S. K. Ltd., Sadashivnagar Dist. Sholapur.

*61. Somaiya Organic Chemicals Ltd., Sakerwadi Dist. Ahmednagar.

62. Terna Shetkari S. S. K. Ltd., Dhoki, Dist. Osmanabad.

63. Tilaknagar Distilleries & Ind. Ltd., Tilaknagar, Distt. Ahmednagar.

64. United Co-operative Distillery, Parite, Dist. Kolhapur.

*65. Walchandnagar Industries Ltd., Walchandnagar Dist. Poona.

66. Walwe Taluka S. S. K. Ltd., Sakharele, P.O. Islampur Dist. Sangli.

Orissa (*1*)

67. Aska Co-operative Sugar Industries Ltd., Aska Berchempur (Ganjam).

Punjab (*2*)

*68. Bhagat Industrial Corpon. Ltd., P. O. Distillery Khasa, Dist. Amritsar.

*69. Jagatjit Industries Ltd., P.O. Jagatjitnagar, Dist. Kapurthala.

Rajasthan (*3*)

70. Ganganagar Sugar Mills Ltd., Sriganganagar.

71. Mewars Distilleries & Chem. Works, Bhupalsagar, Dt. Chitogarh.

*72. Udaipur Distillery Pvt. Ltd., Udaipur.

Tamil Nadu (*6*)

*73. Arvind Distillery Pvt. Ltd., Kadampuliyur, Panuti, Dist. South Arcot.

*74. E. I. D. Parry Ltd., Nellikuppam.

75. Southern Agrifurane Industries Ltd., 8, Poes Garden, P.B. No. 4904, Madras.

*76. Sakthi Sugars Ltd., 8/28, Race Course, Coimbatore.

*77. Trichy Distilleries & Chem. Ltd., Senthannipuram, Golden Rock, Tiruchirappali.

78. Vorion Chemicals & Distilleries Ltd., Vadanagarpuram, Chingleput.

Uttar Pradesh (*24*)

*79. Ajudhia Distillery, Raja-ka-Sahaspur, Dt. Moradabad.

*80. Alco Chem. Ltd., Soohara Dt. Bijnor.

81. Allahahad Distilleries Association, Allahabad.

*82. Captainganj Distillery, Captainganj, Dt. Deoria.

*83. Cariw & Co. Lt., Bosa, Dt. Shajahanpur.

*84. Central Distillery & Chem. Works Ltd., Meerut Cantt.

*85. Co-operative Co. Ltd. (Distillery) Saharanpur.

*86. Daurala Sugar Works (Distillery) Daurala Dt. Meerut.

87. Doon Vally Distillers, P.O. Doiwala, Dehra Dun.

88. Faizabad Distillery, Faizabad.

*89. Hidustan Sugar Mills Ltd., Golagokarnnath, Dt. Kheri.

*90. Kesar Sugar Works Ltd., Baheri, Dt. Barailly.

*91. Modi Distillery, Modinagar, Dt. Meerut.

*92. Mohan Mohan Meakin Breweries Ltd., Mohannagar (Gaziabad).

*93. Mohan Meakin Breweries Ltd., Lucknow Distillery, Lucknow.

*94. Narang Industries Ltd., Nawabgang, Dt. Gonda.

*95. Oudh Sugar Mills Ltd., Hargaun, Dt, Sitapur.

96. Pilkhani Distillery & Chem. Works, Pollkhani, Dist. Saharanpur.

*97. Rampur Distillery & Chem. Co. Ltd., Rampur.

*98. Saraya Distillery, Saradarnagar, Dt. Gorakhpur.

*99. Sri Shadilal Distillery & Chem. Works, Mansurpur Dt. Muzaffar-nagar.

*100. Shamli Distillery & Chem. Works Shamli, Dist. Muzaffarnagar.

*101. Simbhaoli Industries Pvt. Ltd., Simbhaoli, Dt. Meerut.

*102. Standard Refinery & Distillery Ltd., Unnao.

West Bengal (3)

*103. Carew & Co. Ltd., Asansol, (E. Rly).

*104. Eastern Distilleries Pvt. Ltd., Russa Distillery, Tallygunge, Calcutta.

*105. Shaw Wallace & Co. Ltd., Bhadrakali Distt. Hoogli.

Note : Units borne on the list of DGTD are indicated with asterisk marks.

Source : Co-operative Sugar Directory and Year book 1975-National Federation of Co-operative Sugar Factories Ltd., New Delhi.

ANNEXURE—III

Import of Alcohol into India from 1970-71 to 1975-76

(Qty. in tonnes Value in '000 rupees)

Variety	Country of origin	1970-71		1971-72		1972-73		1973-74		1974-75		1975-76	
		Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ethyl Alcohol	France	—	—	—	—	10859	9120	—	—	—	—	—	—
undenatured	West Germany	—	—	—	—	—	—	—	—	1	19	negl.	5
	Malaysia	—	—	—	—	—	—	1	49	—	—	—	—
	U.S.A.	10491	9971	—	—	19034	15736	16863	20658	—	—	—	—
	U.S.S.R.	—	—	—	—	—	—	1	7	—	—	—	—
	Singapur	—	—	—	—	—	—	—	—	—	—	negl.	negl.
	Japan	—	—	—	—	negl.	—	—	—	—	—	—	—
	Sweden	1	7	—	—	—	—	—	—	—	—	—	—
	E. Germany	—	—	—	—	—	—	negl.	5	—	—	—	—
Denatured	W. Germany	15	179	negl.	negl.	—	—	2	105	—	—	—	negl.
ethyl alcohol	Japan	negl.	2	—	—	—	—	—	—	1	41	—	—
	U.S.A.	—	—	—	—	—	—	—	—	—	—	1	3
	U.K.	2	34	negl.	negl.	—	—	—	—	—	—	—	—
	Total :	10509	10193	negl.	negl.	29893	24857	16857	20825	2	60	1	36

Source : D.D.C.I.S., Calcutta.

Note : Totals may not tally with sum of individual figures, due to rounding off.

Negl. : Negligible.

ANNEXURE—IV

Exports of Alcohol from India from 1970-71 to 1975-76

(Qty. in tonnes Value in '000 rupees)

Variety	Exported to	1970-71		1971-72		1972-73		1973-74		1974-75		1975-76	
1	2	Qty. 3	Value 4	Qty. 5	Value 6	Qty. 7	Value 8	Qty. 9	Value 10	Qty. 11	Value 12	Qty. 13	Value 14
Undenatured ethyl alcohol	Japan	—	—	10164	6573	—	—	—	—	—	—	—	
	U.K.	—	—	2034	1232	—	—	—	—	—	—	—	—
	Nepal	—	—	—	—	42	31	34	26	21	20	negl.	1
Denatured ethyl alcohol	Nepal	—	—	—	—	18	17	—	—	—	—	1	11
		—	—	12198	7805	60	48	34	26	21	20	1	12

Source : D.G.C.I.S., Calcutta.
Note : Totals may not tally with the sum of individual figures due to rounding off.
Negl.: Negligible

ANNEXURE — V

Allocation of Alcohol from Surplus State (in m. litres)

Sr. No.	States	Years* 1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
1.	U.P.	5.5	63.6	36.5	14.0	31.9	42.6	32.1	33.2
2.	Bihar	0.5	19.1	12.6	4.3	5.8	9.3	5.6	9.5
3.	Mahrashtra	1.0	19.1	0.9	11.4	13.7	13.4	9.1	15.9
4.	Haryana	0.4	10.2	6.3	4.9	2.8	5.4	2.9	5.6
5.	Tamil Nadu	1.0	2.5	—	—	—	3.0	24.0	4.7
6.	Karnataka	—	5.2	11.2	3.0	2.3	2.0	3.0	4.1
7.	Andhra Pradesh	0.5	—	—	—	—	—	—	—
8.	Pondicherry	—	—	—	4.0	—	—	—	—
9.	Orissa	—	—	—	—	—	—	0.4	—
10.	Gujarat	—	—	—	—	—	—	0.1	—
	Total	8.9	106.1	67.5	38.0	56.5	75.8	77.2	73.0

*In terms of alcohol years (Dec.-Nov.)
Source : Ministry of Chemicals & Fertilisers.

ANNEXURE—VI

Allocation of Alcohol Deficit State/Agencies

(in million litres)

Sr. No.	State/Agency	Years*							
1	2	1968-69 3	1969-70 4	1970-71 5	1971-72 6	1972-73 7	1973-74 8	1974-75 9	1975-66 10
1.	West Bengal	4.5	44.6	35.0	9.9	16.7	51.0	47.3	44.2
2.	Delhi	0.6	6.3	6.3	5.8	5.8	5.8	5.8	4.8
3.	Andhra Pradesh	—	—	1.0	1.5	15.5	2.2	8.2	5.8
4.	Assam	0.5	1.4	1.0	1.2	1.2	0.7	1.2	1.4
5.	Rajasthan	0.5	1.1	4.0	2.5	3.8	2.8	2.8	3.0
6.	Madhya Pradesh	0.5	negl.	—	—	1.0	0.4	0.4	0.1
7.	Maharashtra	—	5.2	3.6	—	—	—	—	—
8.	Gujarat	0.5	4.2	0.5	0.5	0.6	2.0	3.0	3.8
9.	Orissa	—	negl.	negl.	—	—	0.1	—	—
10.	Kerala	—	0.3	negl.	0.5	1.8	1.8	3.8	2.5
11.	Pondicherry	—	0.1	—	—	—	—	—	—
12.	Tamil Nadu	—	—	—	2.5	—	—	—	—
13.	Punjab	—	—	1.8	1.9	1.8	1.7	—	—
14.	Himachla Pradesh	0.1	—	1.0	0.8	0.8	1.0	0.4	0.8
15.	Uttar Pradesh	—	—	—	6.0	—	—	—	—
16.	Tripura	negl.	0.2	0.2	0.2	0.3	1.3	0.3	0.3
17.	Manipur	negl.	—	0.1	0.1	—	—	—	0.1
18.	Nagaland	0.1	0.1	0.1	—	—	0.1	—	0.1
19.	Goa, Daman & Diu	—	1.8	0.4	0.4	0.4	0.4	1.2	negl.
20.	Sikkim	0.2	0.8	0.8	0.8	0.9	1.4	—	2.0
21.	Nepal	negl.	0.6	negl.	0.1	0.1	0.1	—	0.3
22.	Bhutan	0.1	0.5	0.5	0.9	1.0	1.0	—	2.0
23.	Chandigarh	0.1	—	0.4	0.3	0.3	0.3	0.3	0.3
24.	J & K	0.2	6.6	1.1	1.5	1.0	1.0	1.0	1.0
25.	Defence & DGS&D	—	—	3.0	0.5	3.5	1.5	1.5	—
26.	I.D.P.L.	—	—	—	—	—	—	—	2.3
27.	Exports	—	29.5	6.7	—	—	—	—	8.5
28.	Reserve	1.0	2.9	—	—	—	—	—	—
	Total	8.9	106.2	67.5	37.0	56.5	75.6	77.2	881.1@

* In terms of alcohol years (December/November)

@ Inclusive of exports.

Negl. : Negligible.

Source : Ministry of Chemicals and Fertilisers.

Levies on Industrial Alcohol Consumed within the State

Sr. No.	Levies	U.P.	Bihar	West Bengal	Maha-rashtra	Tamil Nadu	Andhra Pradesh	Gujarat	Haryana
1.	Administrative charges	@0.075	—	—	—	—	—	—	—
2.	State Sales Tax	—	7%(a)	—	15%	8%	6.63%	15%	6%
3.	State Excise Duty	—	—	—	—	0.16%	0.20(c) 0.15(d)	—	11.20%
4.	Surcharge on Sales Tax	—	1%	—	—	5%	—	1.5%	2%
5.	Special Fees	—	—	—	0.41(f)	—	—	0.41(e)	—
6.	Gallanage Fee	—	0.75	—	—	0.10(e) 0.25(d)	— —	—	—
7.	Pass Fee	—	—	0.010(g) 1.60(b)+(d)	—	— —	— —	—	—
8.	Permit Fee	—	—	7%(c)	—	—	—	—	2.00(g)
9.	Entry Fee	—	—	3%(g)	—	—	—	—	—
10.	Transport Fee	—	—	—	0.05	—	—	0.22(e)	—
11.	Vend Fee	1.10(d)£	—	200(e) 10**	—			0.17(d)	—
12.	Purchase Tax	0.40* 0.20	— —	—	—	— —	— —	—	—
13.	Countervailing Duty	—	—	—	—	—	0.10(h)	—	—

Note : Specific rates are per bulk litre

(a) On denatured and rectified spirit
(b) On absolute alcohol
(c) On rectified spirit.
(e) On rectified spirit and absolute alcohol
(f) When issued on payment of duty only
(g) On special denatured spirit only.
(h) On imported alcohol only

*40 paise upto 1 million litres and 20 paise over one million litres but stayed by Allahabad High Court.

**Upto 10,000 bulk litres, thereafter Rs. 10 per kilolitre extra for special denatured spirit

@On Synthetics and Chemicals Ltd. only

£Since struck down by Allahabad High Court.

Levies on Industrial alcohol exported to other states

Sr. No.	Levies	U.P.	Bihar	*West Bengal	Maha-rashtra	Tamil Nadu	*Andhra Pradesh	Gujarat*	Haryana
1.	State Excise Duty	—	—	—	—	0.50(a)	—	—	—
2.	Gallanage Fee					0.25(c)	—	—	—
3.	Pass Fee	1.75(b) 0.25(c)	—	—	— —	— —	— —	— —	— 1.00(d)
4.	Export Fee	—	0.75(c) 0.25(d) 1.60(a)	— —	— 0.25				1.60(a)
5.	Central Sales Tax	4%	4%	—	4%	—	—	—	4%

Note : Specific rates are per bulk litre

(a) On rectified spirit and absolute alcohol

(b) Per alcoholic litre on rectified spirit

(c) On denatured spirit

(d) Special denatured spirit

(*) Generally deficit States

TECHNICAL REPORT ON THE WORKING OF INDIAN DISTILLERIES

No. 1. Control over the chemical and biological process and the operation of the distillation units requires careful attention. Some of the distilleries do not have adequate laboratory facilities and in the absence of such instruments like Ph meter etc., it is not possible for them to exercise control over the various processes in the distilleries.

No. 2. The necessity for proper laboratory check of the fermentation processes at every stage cannot be over stressed. The nutritional demand of the yeast, its proliferation from stage to stage, control over the yeast inoculum used in the fermenters, control over acidity and careful tabulation, of the increase in acidity during the course of rementation, besides temperature control during the process forms key note to a successful fermentation to obtain the maximum yield of alcohol from molasses.

No. 3. Fermenters in some of the distilleries get coated with the deposits of calcium sulphate which become focal points for contamination and as such it is very necessary to prevent these deposits on the metal surface of the fermenters. The fermenters should therefore be throughly cleaned and teamed if necessary before each fermentation. In some distilleries the pipeline connecting fermenters to and fro may also have small pockets of liquids which serve as a source of contamination. These pockets should also be flushed and steamed regularly.

No. 4. In some distilleries there is no appropriate temperature control on the fermenters which result in insufficiency of fermentation, and larger losses from vaporisation and formation of increased quantities of alehydes and other by-products. It is, thus, imperative that temperature should be controlled between 32° and 33° by installing heat exchangers functioning as coolers with pump circulation. If this is done then it would be possible to remove heads from the fermenting liquid by cold water flowing on either sides of the plates in the cooler and a number of fermenters could be connected to one such circulating pump and heat exchanger. The other advantage is that water after cooling the fermenting wort can be re-used either for wort dilution or in the condensers. A plate type high velocity heat exchanger could be appropriate for such purposes. Care should be taken for sterilisation of the heat exchange system from time to time. The method of cooling of fermentation tanks by spraying water on the outer walls of the m.s. fermenters is not very satisfactory as in certain cases where sufficient water is not available at low temperature the cooling may not be satisfactory.

No. 5. In most of the distilleries open fermentation tanks are used which are likely to result in losses of alcohol. If the fermentation tanks are covered carbon dioxide could be easily scrubbed with water through a small column containing perforated baffles. In some of the distillers there are no arrangements for preclarification or for sterilisation of molasses. Since there is frequent scaling in the columns and contaminations of molasses takes place, it, is advisable to pasteurise molasses after partial dilution with water and addition of sulphuric acid to adjust Ph about 4. This pasteurisation could result in sedimentation. In any system of pasteurisation it would be necessary to instal heat exchangers to recover excess heat.

No. 6. The determination of fermentable sugars at the appropriate stage is a must in a distillery as the determination of residual sugar by a distillery as the determination of residual sugar by Fehling's solution may be misleading. The best test is an actual laboratory fermentation. The quantity of sulphuric acid and of inorganic nutrients required for the fermentation should also be determined in relation to the actual Ph of the molasses and not adopted according to any standard invariable formula.

20—1 M of PC&F/ND/78

In most of the distilleries steam supply is controlled manually which is not conducive to maximum efficiency. In view of this, it is most essential to have automatic regulation of steam supply. In most of the distilleries distillation process control intruments have not been installed, such as flow-meters and recorders which should be installed at all vital points. The recorder for regulating steam is a must for distillation units. The flow rate of wash feed and the final product draw should be recorded through flow meters as these are the main points which require control. Further installation of automatic control arrangements for the entire distillation process by regulating the flow of wash, steam fed and the alcohol draw rate by regulating the temperautre at a particular point in the rectifying column is necessary. Installation of slop tester is essential as it will help to indicate the alcohol content of the spent liquors. In most of the distilleries fusel oil not tapped. It has been found that fusel oil can be ordinarily drawn from the plates where the alcohol concentration is around 40%. A particular point can be arrived at by trial runs to stabilise the plate from which the fusal oil can be drawn. In some of the distilleries the columns, vapour pipelines and wash feed lines are not lagged which should be done to save steam to the extent of 10% by proper lagging.

Heat from the spentwash should be tapped invariably by installing heat exchanger. The under-mentioned suggestions need careful consideration:

(a) the necessity of clarification of malasses and elimination of any possible sediment arising from it during fermentation.

(b) proper control of temperature during fermentation preventing its rise beyond 32°C should be ensured,

(c) proper sanitary conditions in the fermentation house and pipelines therein should be maintained.

By running one of the main distillation columns either under pressure or vacuum it is possible to exercise substantial steam economy. The ditillation unit can be run as double effect evaporator or steam can be generated from the vapours of the beer columns which can be used after compression in the rectifier column. This techniqne can be adopted only when the columns are likely to be replaced as heavier construction material would be necessary for running them under pressure.

In some of the distilleries the compressed yeast from the Indian yeast company are used instead of developing their own yeast cultures and it is reported that this has increased the yield of alcohol per tonne of molasses. This would however result in minimum diversion of sugars for yeast cell proliferation. In any case during the course of fermentation the following suggestion could be kept in mind to improve the fermentation efficiencies:

(1) by using pure yeast cultures and minimising diversion of sugars for yeast cell proliferation efficiency upto 5% can be improved,

(2) by keeping proper control during fermentation conditions such as pH and temperature.

(3) Scrubbing of carbon dioxide gases and collecting alcohol,

(4) minimising losses of fermentable liquor by preventing leaks and reducing loss in yeast sludge.

(5) Alcohol percentage in the wash should be kept at proper concentration. A 4% concentration of alcohol in wash requires 16 kg. steam consumption per gallon of alcohol where as a concentration of 7% requires 10 kg. and a 10% concentration requires only 8 kg. steam.

The efficiencies depend primarily on the extent of control actually exercised on the yeast culture and the fermentation process. If however efforts are made to get the total reducing sugars determined on samples of molasses drawn by an independent authority it can be possible to get 270 litres alcohol per tonne in places where sugar percentage is lower.

To sum up the position the following suggestions require immediate consideration or adoption in the distilleries of the country:

(i) more technical persons with suitable training in alcohol technology may be employed.

(ii) the formation of a society of alcohol technologists who can frequently meet and discuss the problems of the individual units and render help wherever necessary. In fact it would be better to have National Consultancy Service.

(iii) Independent checks on the sugar percentage of molasses are absolutely essential to make the management conscious of the maximum recovery of the alcohol from molasses. Though some chemical control is carried out at the number of distilleries but more extensive chemical control is needed.

Legend to diagram on efficient use of waste-heat

FEED WASH	Templ. °C	SPENT WASH FLOW	Temp. °C	ANALYSER VAPOUR		Temp. °C
1. Fermentation Tank	32	9. Bottom to Degarsing Chamber	105	12. Multipass Heat Exch.	18. Stopping column to spent lees tank	102
2. Condenser, R. Vapour and cold wash	45	10. (a) Sealed Tank		13. Rectifier column		
3. Condenser R. Vapour & hot wash	70	(b) Flash Chamber		14. Condensate to stripping column	19. To wash feed line though a centrifugal pump & Non-return valve	
4. Heat exchanger A.P.V. & Delaval type	80	(c) Receiving Chamber		**RECTIFIER VAPOUR**	**HOT WATER**	
5. Receiving Tank		(d) Centrifugals pumps	90	15. Condenser, hot wash & R. vapours	20. From water condenser to Heat exchanger	58
6. Centrifugals pump		11. (a) Discharge through A.P.V. & Delaval H. Exchanger No. 1	80	16. Condenser, cold wash & R. vapours	21. From H. Exchanger No. 2 to Boiler feed water	70
7. Multipass heat exchanger R. Vapour & hot wash	93	(b) Heat exchanger No. 2 Spent wash & hot water from condensers to Boiler feed water line	62	17. Multipass total condenser, R. vapour & cold water		
8. Analyser column						

1	2	3	4	5	6	7	8	9	10	11
		Other Synthetic Drugs	6.9 tonnes	Not given	0.6 tonne					
		Ether	87.24 tonnes	Not given	nil	Nil				
		Transparent Soap	108.0 tonnes	Not given	42.0 tonnes	22.0 tonnes				
		Spirituous Perfumes	66.0 KL	Not given	8.0 KL	5.3 KL				
8.	Angelo Brothers Ltd., Calcutta	Shellac	Not given	Not given	Not given	Not given	747	535	619	700 (1976-77)
9.	Indian Organic Chemicals Ltd., Bombay	1. Acetic Acid	7500 tonnes	7379	4736	6584	10797	6736	10315	25220 KL (1980-81)
		2. Ethyl Acetate	1350 tonnes	1537	930	2303				
		3. Diethyl Phthalate	10000	78	36	49				
		4. Carboxymethyl Cellulose (CMC)	2000 Letter of intent							
		5. Acetic Anhydride & Acetic Acid	3000 Letter of intent							
10.	Guj. Chem. Distillers India Ltd. (Gujarat)	1. Sodium Carboxymethyl Cellulose	3000 Tons	1782	1530	2009	Not given			9500 KL (1980-81)
		2. Auxiliary Chemicals	1300 ,,	974	946	972				
		3. Acetic Acid	3000 ,,	Nil	Nil	4.3				
11.	The waxpol Industries Ltd., Calcutta.	1. Hydraulic Brake fluid	92000 Litres	144200	154800	159200	88858	102842	99407	25% increase every year.
		2. Kold Kote Thinner	125000 Litres	32253	35622	35994				
12.	Chemicals & Plastic India Ltd., Madras.	PVC	13500 Tons	Not given	5854	9459	Not given	4828	11675	26000 KL (1980-81)
13.	Coates of India Ltd., Calcutta.	Pleoxgarphic			25	30	96 KL	69	66	146 KL (1980-81)
		Gravure			46	42				
		Reducer			40	50				

USERS OF ALCOHOL

Statement showing the items of production and alcohol consumed

		Item of Production	Capacity	Production 1973-74	Production 1974-75	Production 1973-74	Alcohol consumed 1974-75 KL	Alcohol consumed 1975-76 KL	Alcohol consumed 1975-76 KL	Demand in next five years (KL)
1	2	3	4	5	6	7	8	9	10	11
1.	Hindustan Polymer Ltd. (A.P.)	Styrene	10,000 tonnes/year	3368	2570	4208	4260	2720	3970	9000 (1980-81)
2.	The Sirsilk Limited Cirpur-Kaghaznagar (AP)	Acetone Acetic Acid Ethyl Acetate	4,000 tonnes 1,500 tonnes 500	1604 16 148	1992 — 140	2185 30 127	2249	2834	3030	10000 (1980-81)
3.	The Alkali and Chemicals Corpn. of India Ltd., Calcutta (W. Bengal)	Low Density Polyethylene	12,500	12119	11060	12613	33060	29663	33084	3400 (1980-81)
4.	Hindustan Insecticides Ltd., New Delhi	Technical DDT	2,744 Delhi 1,344 Kerala	1945 NG	2907 1358	3038 1450	1050 NG	1461 604	1314 637	1560 KL (1980-81) 773 KL (1980-81) for Rasayani uni 2400 KL in 1980-81
5.	The Bengal Immunity Co. Ltd., Calcutta (W. Bengal)	Mise. Chemical	Not avail.	About 10 tonnes per year			31	37	29	Not given
6.	Cellulose Products of India Ltd., Distt. Ahmedabad, Gujarat	Sodium Alginate Sodium Carboxymethyl cellulose	250 375	137 326	227 187	Not given Not given	1186	1535	2294	4500 1(1980-81)
7.	Bengal Chemical & Pharmaceutical Works Ltd., Calcutta	Spirituous Galenicals Daspone (D.D.S.) and derivatives	700 12 tonnes	Not given Not given	298 0.3 tonne	326 1.6 tonne	Not given	263	228	500 (1980-81)

14.	The Mysore Sugar Company Ltd., Calcutta	Acetic Acid	3000 MT	2346	885	2029	3043	1173	2747	4800 KL (1980-81)
15.	The Calcutta Chemicals Co. Ltd., Calcutta	Misc. Chem.	911 KL					29	32	145 (1980-81)
16.	Somaiya Organic Chemicals Ltd., Dist. Ahmednagar	Acetaldehyde/ Acetic Acid/ Ethyl Acetate	5000 Tons	3060	3504	3161	5668	6230	5536	9500 (1980-81)
17.	Polychem Ltd.	Styrene	14000 T/a	12392	7565	7849	N.A.			2500 KL/a.
18.	India Foils Ltd., W.B.	Liquors Printing ink on Al foil	2699 Kl/a 3000 T	1051 2595	2121 2170	3051 3389	229	185	269	400 KL
19.	Reckitt & Colman of India, West Bengal	Dettol	2500 Kl	760	934	1031	119	114	158	180 KL
20.	Hindustan Lever Ltd., West Bengal	G. Soap	1200 T	903	773	774	680	580	580	750 KL
21.	Indian Duplicator Co. Ltd., West Bengal	Duplicating Stencils	5200 reams per month	39600	32700	27350	193	152	112	150 KL
22.	Synthetics and Chemicals Ltd., U.P.	S. Rubber	30000 T	17383	21900	23300	32200	38400	45400	76300
23.	Ministry of Defence, Arvankadu	Defence			1000 Kl/a					1800 KL
24.	Union Carbide, Maharashtra	Organic Chemicals	13000 T/a	9200	10800	10100	20786	20717	22270	2500 KL
25.	Somaiya Organics (India) Ltd., Barabanki (UP)	Butanol B. Acetate Acetic Acid Ethyl Acetate, Paraldehyde Crotonaldehyde etc. Phthalates	3000 3000 7600 2400 300	1874 3227 172	2328 4430 194	1949 4384 439	11119	14054	13000	22500 (1980-81)

PRODUCERS OF ALCOHOL

Statement showing the capacities and Production of Alcohol

S.No.	Name of the Unit	Installed capacity (KL)	Item	Production 1974-75 (KL)	Production 1975-76 (KL)	Production 1976-77 (KL)	Storage capacity Alcohol (KL)	Storage capacity Molasses (tonnes)	Starting Raw Material	Price of Raw Material
1	2	3	4	5	6	7	8	9	10	11
1.	Tilaknagar Distilleries & Industries Ltd., Tilaknagar, Dist. Ahmednagar (Maharashtra)	5500	Rectified Spirit Potable spirit Denatured spirit Special denatured spirit	3538 820 410 Nil	4169 1075 431 419	4323 989 900 916	10.130	9600	Molasses & malt	Rs. 10.04 MT to Rs. 29.29 per tonne including transport
2.	Chitali Distillery Division (Chitali) Dist. Ahmednagar (Maharashtra)	12000	Rectified spirit	9379	1,65,54	1,19,13	2721	8000	Molasses	Cost = 64.74/quintal Transport = 9.12/tonnes
3.	Walchandnagar Industries Ltd. Dist., Poona (Maharashtra)	6000	Rectified spirit	4145	5727	not given	905	15771	Molasses	Cost = 60/tonnes Transport = 15.27/tonne
4.	Shetkari Sahakari Sakhar Karkhana Ltd., Sangli (Maharashtra)	8864	Rectified spirit Natural alcohol	2462 92	3538 114	not given	1400	20000	Molasses	Molasses obtain from the own sugar factory
5.	Krishna Sahakari Sakhar Karkhana Ltd., Shivnagar, Dist-Satara,	7500	Rectified spirit Denatured spirit Ordinary denatured spirit	6850 1668 774	7149 2180 571	7882 3248 1059	1800	116000		Cost = Rs. 30/tonne Transport = Rs. = Tonne per mile
6.	Poly Chem. Ltd., Bombay (Maharashtra).	9090	Rectified spirit	5553	7830	7562	1067	9400	Molasses	Cost = Rs. 89/tonne Transport = Re. 1 per ton/mile
7.	Somaiya Organic Chemicals Ltd., (Ahmednagar) Sakarwadi Maharashtra	10000	Rectified Sprit	12453	10653	not given	captive use	12960	cane Molasses	Cost = controlled price Transport Ps 24 to Rs. 37/ Tonne

8.	Kosang Co-operative Distillery Ltd., Ahmednagar (Maharashtra)	7500	Distillery commission in Nov.	1976	only and production not given.		1254	6000	Molasses	Cost controlled price Transport not given
9.	Shree Satpuda Tapi Parisar Sahakari Sakhar Karkhana Ltd., Dhulia (Maharashtra).	4500	Rectified spirit	--	2117	2003	1020	7293	Molasses	Molasses not purchased so far.
			Special Denatured spirit	Nil	247	330				
10.	Hiranyakeshi Sakar Kharkhana, Sankeswar, (Maharashtra).	8100	Rectified spirit	4313	4954	4184	1700	5000	Molasses	Rs. 25/-
			Denatured spirit	719	462	437				
11.	Kolhapur Sugar Mills, Kolhapur (Maharashtra).	15000	Rectified spirit	6449	9122	1388	737	11000	Molasses	Rs. 63.38
			Denatured spirit	563	621	726				
12.	Brihan Maharashtra Sugar Syndicate Ltd., Pune, Maharashtra.	6820	Rectified spirit	4758	4692	5560	11880	1088	Molasses	Rs. 37.36.
13.	The cooperative Sugars Ltd. (Chittur) Palghat, Kerala.	2700	Rectified spirit	1741	1080	1333	381	4100	Molasses	Cost = Rs. 62-146/tonne Transport-84 to 135/tonne by road, Rs. 130-165/tonne by rail
			Denatured spirit	80	77	9				
			Special denatured spirit	4	3	4				
14.	Polsons Distillery Kerala	1350	Rectified spirit	943	698	281	424	2000	Molasses	126/-
			Den. spirit	103	49	28				
15.	Ranchi Distillery Lalpur (Ranchi) Girja Shankar Jaiswal (Bihar).	5400	Rectified spirit	51	144	103	347	5600	Coals Molasses	Cost = Rs. 120/tonne including transport
16.	New Swadesh Sugar Mills Champaran (Bohar).	6810	Rectified spirit	3127	2353	2660	7170	70000	Molasses	19.15
			Den. spirit	373	829	1418				
17.	The K.C.P. Ltd. Distt. Krishna Andhra Pradesh	8250	Rectified spirit	5326	5414	Not given		26000	Sugarcane Molasses	Re. 0.50/tonne per mile by road. Use own Molasses
			Den. spirit	162	101					
18.	Sri Sarvaraya Sugar Ltd. Chellu (Andhra Pradesh)	Not given	Rectified spirit	3644	3328	Not given	607	8799	Molasses	Cost = Rs. 80/- plus transport charges
			Heads spirit	177	155					
			Den. spirit	88	148					
19.	Andhra Sugars Tanuku (Andhra Pradesh)	5712	Rec. spirit	4396	5116	5353	736	13877	Molasses	35.06

1	2	3	4	5	6	7	8	9	10	11
20.	A.P. Government Power Alc. Factory (Shakarnagar) (A.P.)	9546	Rec. spirit	9654	11230	12685	1729	11000	Molasses	200
21.	Pampasar Distillery Hospet (Karnataka)	9000	Rec. spirit	4030	3696	4908	1200	10000	Molasses	Molasses purchased at controlled rates. Transport charges from 20 paise per tonne per KM to 40 per tonne per KM
22.	Vanivilasa Cooperative Sugar Factory Ltd. Distt. Chitradurga (Karnataka)	3640	Distillery not yet gone into production				100	6280	Molasses	Not given
23.	The Ugar Sugar Works Ltd. (Karnataka) Mysore.	6819	Rectified spirit Den. spirit	4511 113	3696 105	4312 109	850	10000	Molasses & Malt	Costs controlled price transport Rs. 1/- per tonne by rail.
24.	Mysore Sugar Company Mandya (Karnataka)	9600	Rec. spirit Ab. alcohol	118 5	84 7	98 7	800	10800	Molasses	59.48
25.	Captaingang Distillery Captaingang (UP)	22500	Rectified spirit Industrial Alcohol Ord. Den. spirit	13414 12990 93	15452 14609 82	12810 12794 74	2200	14500	Sugarcane Molasses	Rs. 20/- per tonne on transport costs only Purchase Price not given
26.	Ajudhia Distillery Moradabad (UP)	11000	Rectified spirit Denatured spirit	3089 2554	4520 4017	5074 3496	1684	16000	Molasses	9.83 per quintal
27.	The Hindustan Sugar Mills Ltd. Golagokarannath (UP)	25000	Rectified spirit	15614	15165	not given	2700	10000	Molasses	Purchase price at controlled rates Rs. 55 per tonne on transport costs only
28.	Central Distillery and Chemical Works Ltd. Meerut (UP)	10900	Rectified spirit Plain spirit Denatured spirit	1512 668 197	950 439 354	1989 655 353	2000	10000	Molasses	Molasses purchased at controlled rates

29.	The Kesar Sugar Works Ltd. Bareilly (UP)	10200	Rectified spirit	3971	3037	not given	845	8600	Molasses	Costs controlled price
30.	Alco. Chem. Ltd., Seohara (UP)	16400	Rectified spirit	6480	7616	9227	2100	5595	Molasses	Cost Rs. 82.50 per tonne including transport
30.	Haryana Distillery Modinagar (UP)	7000	Rectified spirit Den. spirit	88 20	80 22	101 18	— 1118	1 lakh	quintal Molasses	Rs. 30/ton
31.	Modinagar Distillery (UP)	7000	Rectified spirit Den. Spirit	88 20	80 22	104 18	— 1118	1 lakh	quintal Molasses	Rs. 30/ton
32.	Modinagar Distillery (UP)	10 lakh gallon	Recitfied Spirit Den. Spirit	3469 2586	3317 2743	3945 2601	1038	92000	quintal Molasses	—
33.	Shamli Distillery Muzaffarnagar (UP)	5455	Rectified spirit Den. Spirit	2506 1589	2378 1786	2652 2384	532	82110	quintal Molasses	—
34.	Oudh Sugar Mill. Hargaon (UP)	13500	Spirit	5993	8569	8719	2400	97000	quintal Molasses	Rs. 32.2
35.	Simbhooli Industries Pvt. Ltd., Ghaziabad (UP)	6000	Alochol IMFL	3183 816	3096 1141	1983 1177	1350	9678	Molssses	Rs. 9/-
36.	E.I.D. Pary India Ltd. (Madras). Tamil Nadu	7600	Rectified Spirit Denatured Spirit Silent Spirit	323 1241 Nil	2901 3870 204	3525 1180 112	830	4700	Molasses	Cost = Rs. 60/- tonnes plus duties bulk molasses used from own sugar factory
37.	Deccan Sugars Ltd., Coimbatore	2200	Rectified Spirit	2134	2504	Not given	160	7000	Molasses	Molasses mainly used from their own sugar factory. Purchase molasses costs Rs. 110/tonne.
38.	Shakti Sugars Ltd., Coimbatore Tamil Nadu	13500	Rec. Spirit Den. Spirit	11444 2927	12643 2827	3312 157	1200	27075	Tonnes Molasses	Rs. 68.25
39.	Arvind Distillery & Chemicals Ltd., Madras Tamil Nadu	6000	Rec. Spirit	4281	2977	3637	980	5000	Tonnes Molasses	Rs. 27.50

1	2	3	4	5	6	7	8	9	10	11
40.	Alembic Chemical Works Co. Ltd., Baroda-3 (Gujarat)	3300	Rectified Spirit Special Denatured spirit Ordinary Denatured spirit	2066 1170 524	2093 1403 471	1895 1269 480	300	8095	Molasses	Cost = Rs. 105.60/ tonne Transport = Rs. 31.30/tonne by rail Rs. 55/tonne by road
41	Shree Bileshwar Khand Udyog Khedut Sahakari Mandi Ltd. Distt. Amreli Gujarat	6000	Rectified Spirit Ord. Denatured spirit Spl. Ord. Spirit	3333 1629 1312	2817 1551 1118	2074 946 1013	698	14000	Molasses	Mainly own sugar factory molasses is used Cost = 63/ per tonne Transport = 17.9/ tonne
42.	Guj Chem Distillers India Ltd., Gujarat	600	Rectified Spirit Spl. Denatured spirit Ord. Denatured spirit	4743 3218 723	4640 3537 1083	4500 4037 58	900	10000	Molasses	Rs. 72.17 — 91.29 — per tonnes delivered price
43.	Co-operative Sugar Mills Ltd. Panipat (Haryana)	4550	Rectified Spirit	5202	4917	4212	1253	8000	Molasses	Cost including transports Rs. to 6.90/tonne
44.	Mohanlal Bhagwati Prasad (Bhilai) Madhya Pradesh	3500	Industrial Alcohol not produced							
45.	The Gangasagar Sugar Mills Ltd. Ganagasagar (Rajasthan)	2700	Rec. Spirit	890	1702	Not given	500	4800	Molasses	Molasses from their own sugar factory
46.	The Aska Co-operative Sugar Industries Ltd. Dist. Ganjam (Orissa)	10	Rec. Spirit	803	1600	1438	900	3000	Molasses	Controlled price Transport does not arise

MINUTES OF THE MEETING HELD WITH AABIDA ON 18TH JULY, 1977

Dr. S. K. Somaiya, President of AABIDA introduced Mr. A. Swaminathan to the Members of AABIDA prefacing his remarks about the Committee appointed by the Government of India to conduct the study and make recommendations for the development of industries based on ethyl alcohol. Dr. Somaiya expressed his gratitude to Mr. Swaminathan for sparing his valuable time for a full fledged discussion for understanding the problems of alcohol based industries. A short note describing the problems of alcohol based industries was submitted.

Mr. Swaminathan addressing the members of the AABIDA stated that he was there to listen to the views of so many experts and wise men in the field. He hoped he would get valuable information on the subject. Alcohol should be placed on the same footing as Naphtha as feed stock he added, as the consumption of the alcohol was of the same magnitude as Naphtha. Naphtha was little ahead because of certain decisions taken 10 years ago when naphtha was comparatively cheaper. Since 1974 developments have taken place so fast that naphtha price has gone up. Comparing naphtha with alcohol he stated that stock of naphtha was not replenishable and required high energy input for utilisation. While alcohol was perennial and required low energy technology.

In view of the above, alcohol and alcohol based chemicals should take a place of pride along with naphtha and naphtha based industries. In order to achieve this, one has to look into the alcohol industry and alcohol based industries. At present alcohol industry was in shocking state with out-dated technology. Unclean conditions of fermentors and unlagged distillation columns were a common occurrence. Distribution of alcohol and its trade is governed by various taxes and levies. It was high time that we should look into the entire business. Mr. Swaminathan requested the members to hurry up replying to the questionnaires already distributed. It was decided that the Secretary AABIDA will undertake to co-ordinate and collect the replies. If any Organisation has not received the questionnire, the Secretary, AABIDA will arrange for the copies. Factual information on conversion factors from alcohol, to Acetaldehyde, Acetic Acid, Acetic Anhydride, Butadiene, Styrene was asked for. If any body was going in for crotonaldehyde information was welcomed.

Experiences of the members and views about the various denaturant used in alcohol were invited with suggestions for improvement. Views of the members were invited on the extent to which increase in capacity was warranted based on market potential with Acetic Acid, Acetic Anhydride etc. and suggestions were asked for additional products. Comments were invited on excise and other controls.

President of AABIDA then invited the members to give their views:

Mr. S. Ramaswamy, Vice President of AABIDA traced the history of manufacture of PVC. Earlier plants were based on carbide as starting material. Later on in 1967 it was replaced with alcohol, when cost of alcohol rose to 40 paise per litre and now it has gone up to Rs. 1.03 per litre excluding transportation. Their plant in Tamil Nadu has a capacity of 15,000 TPA with a requirement of alcohol of 60,000 litres per day. Tamil Nadu is at present surplus with alcohol and these was no difficulty for supplies. However (when State Government had suspended prohibition for 2 years there was a shortage and factory was shut down for 4 months. He suggested toluene as denaturant as it will not interfere with manufacture of ethylene. Commenting on distillery adjunct to alcohol based industries, he was in favour of such a proposition as there would be a saving in sales tax and the unit will be fairly efficient. He suggested reduction in cost of molasses and need for rationalisation in duties and variation in sales tax from State to State. He suggested setting up of permanent committee to study the industries which were not run efficiently.

Mr. C. I. Padmanabhan, Chairman & Managing Director Mysore Chemicals stated that their factory was started in 1962 to utilise alcohol when there was total prohibition in the State. When the prohibition was removed,

the cost of acetic acid went up to Rs. 4.60 per kg. from Rs. 1.95 per kg. which was the cost when the factory was started. The cost of alcohol, excise levies etc, were rising year by year. At present there was dual control on Industrial alcohol by Excise Commission and Industries Department. There were occasions when dilute alcohol was allocated to industries at the same rate as rectified spirit and good alcohol was diverted to potable purposes. At present acetate plastics manufactured from petro base were selling at Rs. 12 per kg. while those from alcohol based were selling at Rs. 25 per kg. He suggested that the taxes should be on weight basis and not on ad valorem basis.

Mr. A. B. Roychaudhary traced the history of alcohol based industries in West Bengal. When molasses had to be disposed of by incurring expenditure, the plant at Rishra was started to help the distilleries in U.P. and Bihar to utilise their product and improve their working. The Industries set up on alcohol have existed for the last 25 years and now they are facing closure for want of adequacy of alcohol. Owing to shortage of alcohol, his Company as well as Synthetic and Chemicals had closed down and alcohol was required to be imported. The steady supply of alcohol to the existing industries needs to be assured.

Mr. D. S. Dalal representing Indian Organic Chemicals stated that before starting new industries, due consideration should be given to regular supply of alcohol. He touched on the cost of pollution control and suggested that the economics of the industries should be studied very carefully.

Mr. Lakhotia representing Sirsilk stated that his Company was started in 1953-54 when alcohol was abundantly available in Hyderabad and the State Government had concluded an agreement to supply alcohol at 10 annas per gallon. He stated that excise duties on acetate and viscose has been kept on par. Viscose has a cheaper raw material. Owing to these difficulties it has not been possible for the last 23 years to give any dividend to the shareholders. For the last 10 to 12 years Andhra Pradesh is having a deficit of alcohol due to abnormal increase in production of potable liquor. The allotment of alcohol gets first preference for potable purposes and the remaining is allotted to industries. Subsequently centre is approached for the requirement but they are not fully met to cover the deficit. Advice to reduce the quantity of potable liquor is not followed. Alcohol distilleries flout the price control order and charge higher prices. He asked whether sugar factories have spent the funds allocated for storing of molasses and whether this factor be allowed to continue. He also referred that the excise authorities do not allow for evaporation losses or transit losses. He was not in favour of distilleries attached to downsteam Industries because cost of transport of molasses will be more than the cost of transport of alcohol.

Mr. Doriwala representing Gujchem distillery stated that even though their Company have their own distillery elsewhere in the State, they were not allowed to use alcohol. Being a deficit State, Gujarat has to import alcohol. Therefore in their case they sell alcohol at lower price and use imported alcohol at higher price. The capacity utilisation of their plant would be 120%. However, due to shortage of alcohol in the last year it was 74% and in the current year it would be 75%. There was some difficulty in the supply of coal to the Factory. He suggested that for a deficit State, alcohol allocation should be made sufficiently earlier because there was considerable time lag between allocation and release of alcohol. From December to February their plant was run at 40% capacity because of this difficulty.

Mr. O. P. Narang representing Atul Chemical Industries said that since the distilleries from which the allocation would be made are not known earlier, they have to store denaturant at various places.

Mr. U. B. Rao, representing Polychem, stated that there was no escalation factor when Tariff Commission recommends the prices. This creates a difficulty when the cost of various factors contributing to production goes up. He was in favour of integrating distilleries and sugar factories so as to utilise free steam from the sugar factories during the crushing season, avoid a major portion of molasses transport costs, provide better storage for captive molasses and take advantage of better maintenance and administrative set up of the sugar

factories. Mr. G. S. Singania representing Kolhapur Sugar stated that the present distilleries have not remained economic though when they were started they were economic units. These distilleries should be allowed to expand to become economic. However the present Government policy was to allow new distilleries in co-operative sectors. He supported the formation of permanent Committee for Efficiency Improvement.

At this stage, Mr. Swaminathan requested the members to give their more constructive views such as conversion of cellulose direct to alcohol.

Shri Vasant Khare representing Union Carbide stated that as far as the feed-stocks are concerned, certain chemicals can be preferably based on alcohol and others on Naphtha. Considerable Research and Development work is required to find out new sources of alcohol.

Shri S. L. Kikeri representing M/s. Somaiya Organic stated that a few industries should be selectively licensed exclusively on alcohol as feed-stock and others on petrochemicals as feed-stock. He observed that U.P. Government was inclined to direct molasses or alcohol to the parties where they may get increased revenue. It would be better to have long term policy to develop the industries.

Shri Roychowdhury representing ACC stated that economics of utilising alternate sources of alcohol have to be looked into. It may not be possible to utilise all sugar-cane produced for the manufacture of sugar molasses. There may be a possibility of converting sugar-cane directly to alcohol.

Shri C. J. Mehta representing M/s. Somaiya group stated that Cellulose enzyme was difficult to obtain in a pure state and therefore, it is rather difficult to utilise cellulose to convert into alcohol. He mentioned that rat and similar animals have cellulose which they utilise to convert materials such as wood, grass and other forest products into sugar. This enzyme can be extracted and developed for use in utilising other feed-stocks. He suggested formation of a know-how Committee to conduct Research and Development work in enzyme technology. He mentioned the possibility of converting sucrose directly to polymers eliminating the intermediate stage to alcohol.

Mr. P. M. Kavadia representing M/s. Somaiya Organic Chemicals supported the suggestion of Technical Committee of AABIDA for studying the areas of growth and technical aspect of the industry. He pointed out a few anachronisms in the alcohol industry.

1. In surplus State like Tamil Nadu, a plant was closed for 4 months.

2. When exports of alcohol were allowed, within a month imports had to be allowed.

3. It was necessary to develop a healthy industry. For this purpose it was necessary to have alcohol available in time in adequate quantities at a fair price free from the burden of levies and taxes. He stated that present distilleries are allowed to increase their capacity by 25%. In his view, since sugar production is increasing steadily, it would be possible to meet the present and future demand of alcohol based industry.

4. Dr. S. K. SOMAIYA, President of AABIDA, thanked Shri Swaminathan for having spared the whole of half a day to spend with them and understand the problems of the industry at first hand. He further said that he was happy that all the AABIDA members had taken active interest and made concrete suggestions. He was particularly thankful to Shri Ramaswamy, Roychowdhury and Lakhotia and other mofussil members for having come from long distances.

Dr. Somaiya said that alcohol based industries had a bright future. Of course there were many problems and we are sure that they should be resolved. It was very appropriate that the Committee has been appointed by the

Govt. to look into the question of planning and future set up of alochol chemical industries. He said he had no doubt that like the first Nagaraj Rao Committee, this Swaminathan Committee would become a blueprint for the alcohol based chemical industries for the next 20 years.

Concluding remarks of Shri Swaminathan:

Concluding the deliberations of the meeting, Mr. A. Swaminathan stated that:—

1. If consumption of potable alcohol is kept at the same level, the existing sugar industries will be able to meet the requirements of alcohol in future However, unless molasses are removed from the sphere of potable liquor industry, it was impossible to achieve this goal.

2. Sugar indutry was expected to grow very much in the future.

3. Referring to the suggestions of utilisation of Khandsari molasses, it was one thing to exercise control but even more difficult to implement it. It would mean that consumers will have to change from the use of Khandsari to crystal sugar. Thinking of present Government is in Gandhian approach and it may be that production of gur will increase and there may not be molasses of Khandsari.

4. There was likelihood of total prohibition in the country and that may give fillip to alcohol based industry.

5. It will take a long time to disturb Centre and State balance in respect of Alcohol Industry as it will require a change in the Constitution.

6. We were sometimes thinking in a very narrow and short sighted way. The industry should revise its thinking.

7. Referring other areas of growth and diversification of industry, he stated that it takes 2.7 K. lt. of alcohol to produce 1 Tonne of polyethylene. It would be better to use petrochemicals as feed-stocks for such high alcohol consumption products.

8. Consumption of total alcohol will increase in future whether there was prohibition or no prohibition. It is high time we should start thinking for an alternative source of alcohol so that in the next 10 years we can get additional half a million tonnes of alcohol.

STATISTICAL DATA COMPILED BY

SOMAIYA ORGANICS (INDIA) LIMITED

Index of Statement of Alcohol-Based Chemicals Licences and Letter of Intent if any, Productive and Alcohol Requirement for the same

Statement Showing Consolidated Requirement of Alcohol Calculated on Productwise Basis in respect of Licences in force and new Licences when implemented.

Sl. No.	Product	Lic. in force 1976	New Lic. issued[1] likely to be implemented in 1979-80	Unit factor alcohol in lit. pet MT.	Alcohol reqd. in alcohol in productwise 100% basis	Alcohol read. in 1980-81 110% (1980-81)
1.	Acetic Acid (By 1980 — 13,300 MT. will be added)	36940	12800	1430	55.40 19.20	79.0
2.	Acetone	1500	6000	2600	—	19.5
3.	Butanol	5900	—	2180	15.00	20.0
4.	Ethyl Acetate	7690	—	845	6.50	7.2
5.	Polyethylene	20000	—	2730	54.60	60.1
6.	Polystyrene	26000	—	910	23.60	26.0
7.	P.V.C.	14000	—	1300	18.20	20.0
8.	Synthetic Rubber (SRR Nitrile Rubber)	30000 (2000)	—	2430	72.90	80.2
				Total	265.40	312.0

Note: 1) Expansion and new Lic. are issued only for Acetic Acid. One Lic. is issued of Acetone but as yet not implemented.

2) Source of information as to the actual lic. in force and implemented are as per DGTD (compilation from them in November 1976). Acetic Acid lic. list brought upto date.

3) It is assumed that IDPL, Muzaffarpur, Orissa Idl. Dev. Corpn., Orissa, HOC, Rasayani, and Tamil Nadu—Their lic. for Acetic Acid = 4,500 MT + 3,300 3,000 + 1,000 MT respectively = Total—will be implemented by 1979-80.

4) Acetone based on Alcohol is rarely being produced but in view of increased demand, it is assumed that alcohol based unit will also produce Acetone.

Statement showing Alcohol factor per M.T on of Alcohol-based Chemicals (in Kgs. and ltrs)

1. Acetic Acid	1100 Kgs per MT. or 1130 Lit. per M. Ton
2. Butanol	1680 Kgs Per MT . or 2180 Lit. Per M. Ton
3. Acetone	2000 Kgs Per MT, or 2600 Lt. Per M. Ton
4. Ethyl Acetate	650 Kgs Per MT. or 845 Lt. Per M. Ton
5. Polystyrene	700 Kgs Per MT. or 910 Lit. Per M. Ton
6. Polyethylene (Low density)	2100 Kgs Per MT. or 2730 Lit. Per M. Ton
7. P. V. C.	1000 Kgs Per MT. or 1300 Lit. Per M. Ton.
8. Synthetic rubber	1870 Kgs Per MT or 2430 Lit. Per M. Ton

Acetic Acid licence in force together with Letter of Intent and new licence issued upto date as on April 1977

Sl. No.	Name of the Unit	Licensed Regd. capacity	(Annual) capacity Existing	Foreign collaboration, if any.¶
1.	Sirsilk Ltd., Sirpur	3100	3100	Know-how along with C.G.
2.	Somaiya Organ-Chem, Sakarwadi	6000	6000	Do.
3.	A.P. & Dev. Corpn., Hyderabad	1680	1680	Do.
4.	Andhra Sugar Ltd., Tanuku	1080	1080	Do.
5.	Kolhapur Sugar Mills, Kolhapur	3200	3200	Do.
6.	Union Carbide India Ltd.	1360	1360	Financial Collaboration with UCLL, U.S.A.
7.	Indian Organic Chem., Bombay	7000	7000	Know-how purchase with C.G.
8.	Mysore Sugar Ltd.	3000	3000	Do.
9.	Somaiya Organics (I) Ltd., Bombay	7600	7600	Know-how LES Usines France.
		33940	33940	

BUTANOL

Statement showing licences issued for Butanol as are in force 1976

Sl. No.	Name of the Unit	Licensed capacity (in Tonnes/Annum)
1.	Kolhapur Sugar Mills Ltd., Kolhapur	900 Tonnes/annum
2.	Union Carbide India Ltd., Bombay Factory at Trombay.	3000 Tonnes/annum
3.	Somaiya Organics India Ltd., Barabanki (UP) Factory at Barabanki	3000 Tonnes/annum
	TOTAL	6900

Statement showing Acetone (Alcohol based) licences as are in force 1976

S. No.	Name of the Unit	Lic. capacity
1.	Sirsilk Ltd., Hyderabad. Factory at Sirpur Cordite Factory, Tamil Nadu	1500 Tonnes/annum 1500 Tonnes/annum
2.	New licence issued to U. P. State Industrial Development Corporation.	6000 Tonnes/annum

Statement showing Ethyl Acetate licences as are in force as on 1976

Sl. No.	Name of the Unit	Licenced capacity in tonnes/annum
1.	Andhra Sugar Ltd., Venkatarayapuram, P.B. No. 2 Tenuku West Godavari Dist Factory at Tanuku.	1270 Tonnes/annum.
2.	Sirsilk Ltd., Sirpur Kaghaznagar, Adilabad Dist : Sirpur	1960 Tonnes/annum.
3.	Acetic Acid Plant, Andhra Pradesh Industrial Dev. Corpn., Hyderabad.	240 Tonnes/annum.
4.	Mysore Acetate & Chem., Co. Ltd., Bangalore, Factory at Mandya, Mysore.	600 Tonnes/annum.
5.	Indian Organic Chem. Ltd., Apollo St., Fort, Bombay. Factory at Khopoli, Dist. : Kolaba.	1500 Tonnes/annum.
6.	Kolhapur Sugar Mills, Ltd., Kasaba Bavada, Kolhapur-3.	900 Tonnes/annum.
7.	Union Carbide India Ltd., 15 Mathew Rd., Bombay-4.	700 Tonnes/annum.
8.	Somaiya Organics (I) Ltd., Narang House, 34 Ch. Shivaji Maharaj Marg, Bombay-1. Factory at Barabanki.	500 Tonnes/annum.
	Total	7670

Statement showing Poly Ethylene (low Density) (Alcohol based) licences as are in force in 1976

Sl. No.	States	Licenced capacity	Installed capacity
A.	West Bengal	10,000	20,0000
B.	Maharashtra	20,000	20,000*

*UCIL, they have now switched over to Naphtha.

Statement showing Polystyrene (Alcohol based) licences as are in force, 1976

Sl. No.	States	Licenced capacity	Installed capacity
A.	Maharashtra	16,000	16,000
B.	Andhra Pradesh	10,000	10,000*
	Total	26,000	26,000

Statement showing P.V.C. (Alcohol Based) licences as are in force 1976

	States	Licenced capacity	Installed Capacity
A.	Tamil Nadu	20,000	14,000

Statement showing Synthetic Rubber (Alcohol-based) Licences as are in Force 1976

Sl. No.	Name of the Unit	Licenced capacity
1.	Synthetic & Chem. Ltd., Insurance Bldg., 7 J. T. Road, Bombay. Factory at Bareilly, U.P.	SBR 30,000 tonnes/annum Nitrile Rubber 200".

Statement showing recommended allocation of Alcohol as per ALCOHOL COMMITTEE 1977 (Annexure II) of Background Paper on Growth of Alcohol and Alcohol-based Industries

Name of the State	Name of the Industry	Recommended allocation of alcohol during 1975-76 (in m. litres)
1. Uttar Pradesh	Syn. & Chemicals & Somaiya Organics	68.0
2. Delhi	D.D.T. Factory	1.8
3. Gujarat	Pharmaceuticals & Other miscellaneous Industries.	12.00
4. Maharashtra	Union Carbide, Acetic Acid and others	75.0
5. West Bengal	ACCI & Others	45.0
6. Andhra Pradesh	Acetic Acid & Others	32.0
7. Tamil Nadu	Chemplast and other (PVC)	21.0
8. Karnataka	Cellulose Acetate & others	8.0
9. Kerala	D.D.T. Factory	1.8
	Total	264.6
	Say	265.0

ANNEXURE — 'V'

Estimated Consumption of Alcohol in 1981 in ml. litres (as per Fermentation Council of D.G.T.D., Govt. of India, New Delhi)

1.	Synthetic Rubber	75 Million lit. (77)
2.	Plastic Material L.D.P.E. P.V.C.	 80 ,, 40 ,,
3.	Organic Chemicals Acetic Acid Butanol Acetone Ethylene Chloride Ethylene Bromide	75 ,,
4.	Pesticides	6
5.	Pharmaceutical	
6. (a)	Misc. items (Potable etc.)	180 ,,
(b)	Other small-scale users	90 ,,
(c)	Paints & Varnishes	40 ,,
(d)	Hospitals	40 ,,
	Total	612 ,, (644)

Source : Discussions at Fermentation Panel Meeting in Madras.

GENERAL OBSERVATION

Compound Growth of Rate as assessed by D.G.T.D. in respect of the following chemicals

Sl. No.	Products	Consumption between 1966/1971	Percentage
1.	Acetic Acid	1966/1971	11.8%
2.	Butanol	,,	27.6%
3.	S.B.R.	,,	4.7%
4.	L.D.P.E.	,,	15.3%
5.	P.V.C.	,,	28.5%
6.	Styrene.	N.A.	

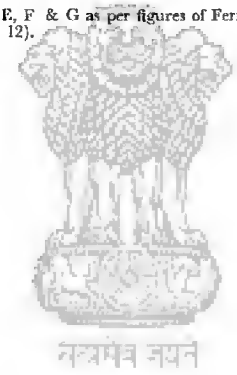
Statement showing comparative position of estimated consumption of Industrial Alcoho

	By 1981 in million litres
(A) For Industrial uses	296.7
(B) Pesticides	6.0
(C) Pharmaceuticals	—
(D) Misc. Items (Potables)	180.0
(E) Other small scale users	90.0
(F) Paint & Varnishes	40.0
(G) Hospitals	40.0
Total . . .	652.7

Note : (1) Item No. A is compiled on basis of licences and 10% growth by 1981 on basis of installed capacities of 1976 & new licences (assumed to be implemented by 1980).

(2) Item No. B, C, D, E, F & G as per figures of Fermentation Council's figure (Please refer Annexure No. 12).

Bombby,
27-6-77,



MGIPCBE—S3—1 M of PC & F/ND/78—13-6-78—500.